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REPORT

ON THE

ORIGIN AND SPREAD OF TYPHOID FEVER IN U. S. MILITARY CAMPS DURING THE SPANISH WAR OF 1898

BY

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Surgeon-General ROBERT M. O'REILLY, United States Army.

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WAR DEPARTMENT,
OFFICE OF THE SURGEON-GENERAL,
Washington, November 1, 1904.

The publication of the complete report of the Board on the Origin and Spread of Typhoid Fever in United States Military Camps During the Spanish War of 1898, by which this vast and valuable collection of data is made available for the profession at large, is largely due to the interest and appreciation of the late honorable Secretary of War, Mr. Root, supplemented by the action of Congress in appropriating the necessary funds.

Since the publication of the abstract the personnel of the board has been still further reduced by the lamented death of Maj. Walter Reed, whose work in this connection together with that of his deceased colleague, has been set forth in such an appreciative manner by the surviving member of the board, Prof. Victor C. Vaughan, of the University of Michigan.

Professor Vaughan, whose special fitness for this work is well known to the medical world, has labored unceasingly to put the full report in such shape as to make it a classic not only for the study of the epidemiologist, but also for the use of the entire medical profession.

I desire to express my appreciation of the successful results of his painstaking and intelligent work.

C. L. HEIZMANN,
Assistant Surgeon-General, U. S. Army,
Acting Surgeon-General.

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LETTER OF TRANSMITTAL.

The SURGEON-GENERAL UNITED STATES ARMY.

SIR: I have the honor to forward herewith the report of the board of medical officers convened per Special Orders, No. 194, Adjutant-General's Office, August 18, 1898. An abstract of this report was published by the Government in 1900, and provision for the publication of the complete report was made by act of Congress, March 3, 1903. Mr. Myers, chief clerk, Army Medical Museum, rendered the board valuable assistance in the preparation of tables and charts, and during the summer of 1904 the eminent English epidemiologist, Dr. Christopher Childs, has gone over the greater part of the manuscript and made many wise suggestions. I am greatly indebted to Doctor Childs for his most valuable aid, rendered at great personal sacrifice and prompted solely by his deep and intelligent interest in the subject. If governments ever learn that military campaigns should be conducted in accord with hygienic rules and that the commanding officer who needlessly and ignorantly sacrifices his men to disease is as unworthy of his position as one who makes a like sacrifice in the face of the enemy, it will be through the labors of such men as Doctor Childs.

I am sure that in transmitting this report, the joint production of the three members of the board, it will not be amiss for me to say a few words concerning the labors of my dead comrades. Maj. Edward O. Shakespeare is well known for his many valuable contributions to scientific medicine, and especially for his exhaustive report on Asiatic cholera, which resulted from his study of the disease in Spain and India as special commissioner from the United States Government; also for his brilliant investigation of the outbreak of typhoid at Plymouth, Pa., the report of which has become a classic in the annals of epidemiology. He entered upon and pursued the work assigned to this board with an expenditure of energy and time that did much to shorten his life already placed in jeopardy by the herculean task, self imposed, in the collection of data and the preparation of the cholera report. Although honorably discharged from the service on June 30, 1899, at a time when this report was far from complete, on the ground that the Government had no more money to put into the investigation, Major Shakespeare continued his work in which he had become deeply absorbed, giving all his energy and sacrificing his health until his sudden death on June 1, 1900, the day before the members of the board were to come together to compare the results of their studies and to formulate the general conclusions. Major Shakespeare was eminently fitted for the work of an epidemiologist, to trace effect to cause, and to follow the path blazed by the axe of science wherever it might lead. There was no detail too onerous to cause him to seek a shorter cut. Time and application were never counted when he sought for truth. There was no task too heavy if it promised to lead to a solution of the problem in hand. He was never tempted to generalize until he had mastered every detail. His part of the report covers the Second Army Corps at Camp Meade and the Second Division of the Seventh Army Corps at Jacksonville, and the special problem in which he became so deeply absorbed and to the elucidation of which he gave so much time and energy was the spread of typhoid fever by contact, "tent, squad, or comrade infection," and the preparation of such maps as those of the Fifteenth Minnesota and certain other regiments in the above-mentioned organizations furnish most positive proof that the dissemination of typhoid fever in the military camps in 1898 was most largely from person to person by contact and not through infected water or food. Others have suspected that typhoid might be spread in this way, some have asserted it, especially since the first publication of his work, but Major Shakespeare has demonstrated by a detailed study, which I believe to be without a parallel in the annals of epidemiology, that typhoid fever is as contagious as well as an infectious disease, and that isolation and disinfection are essential procedures in abating certain epidemics of this disease in armies.

Maj. Walter Reed, chairman of the board, was eminently suited for this work. Inasmuch as he alone of the members was a military man, all questions concerning the application of sanitary measures for the abatement of the epidemic in the different camps—and this was quite naturally the primary reason for the creation of the board—were referred to and decided by him. Major Reed was not only the director of the work, but labored most earnestly in the study of scientific detail. As his subsequent investigations on the etiology of yellow fever

demonstrated he was one of the truly great scientists who have contributed to preventive medicine, and his name has been written along with those of Jenner and Pasteur among those who have blessed the race by placing in man's hands the means of self-protection from the most deadly diseases. The careful thought, the rigid logic, the unerring grasp of every detail involved in the conception and execution of his experiments on the transmission of yellow fever show him to have been a man without a superior and with but few equals in the history of science. The problem in the studies of this board, to which Major Reed gave most of his time and attention, was that of the relation to typhoid fever of the short diarrheas and so-called malarias. As may be seen by those who read the report, the statistical evidence that the short diarrheas and so-called malarias gave temporary protection against typhoid fever was very strong. Major Reed frequently expressed regret that he had not the opportunity of applying the Widal test in a number of individuals showing so-called malarias and diarrheas in the midst of a typhoid epidemic. This opportunity came when he was ordered to Cuba to study an outbreak of typhoid in the Eighth United States Cavalry, and, as may be seen from this report, the statistical evidence that these temporary illnesses were actually due to typhoid infection was confirmed by the Widal test.

It was an honor to be associated with these men, and no one knows better than the writer the extent to which this report fails in completeness because he has not had their wise help in preparing the manuscript for publication.

Respectfully,

VICTOR C. VAUGHAN,
Surviving Member of the Board.

INTRODUCTION.

The board was created by the following:

SPECIAL ORDERS, }
No. 194. }

WAR DEPARTMENT,
ADJUTANT-GENERAL'S OFFICE,
Washington, August 18, 1898.

40. A board of medical officers, to consist of Maj. Walter Reed, surgeon, U. S. Army; Maj. Victor C. Vaughan, division surgeon, U. S. Volunteers, and Maj. Edward O. Shakespeare, brigade surgeon, U. S. Volunteers, is appointed to meet in this city at the earliest date practicable for the purpose of making an investigation into the cause of the extensive prevalence of typhoid fever in the various military camps within the limits of the United States, under such instructions as it may receive from the Surgeon-General of the Army. The board will call the attention of the proper commanding officers to any insanitary conditions which may exist at the camps visited by it, and will make recommendations with a view to their proper correction. The report of the board will be forwarded to the Surgeon-General as soon as practicable after the completion of the investigation contemplated.

Such journeys as may be required under the above order are necessary for the public service.

By order of the Secretary of War:

H. C. CORBIN, *Adjutant-General.*

In compliance with these orders the board proceeded immediately to Camp Alger, Va., where the Second Army Corps was then located. Here we found many soldiers in the hospitals sick with continued fever. The members of the board were soon convinced that this illness was typhoid fever, but inasmuch as some of the surgeons in attendance at these hospitals insisted that the disease was malaria, the board returned to Washington and requested the Surgeon-General to place in all the hospitals in the camps in the United States men competent to examine the blood for the malarial parasite and to make the Widal test for typhoid fever. This request was granted, and as will be shown throughout the report it was conclusively demonstrated that the prevailing sickness in the camps in the United States in 1898 was typhoid fever, and that cases of malaria were exceedingly rare.

After spending six days at Camp Alger, and having made a thorough study of the hygienic conditions of the camp, and having placed the examination of the blood in competent hands, the board proceeded to Fernandina, Fla., where the Fourth Army Corps was then encamped. On arriving at this place it was found that this corps was preparing to remove to Huntsville, Ala. However, the board spent two days in examining the camp site, in visiting the hospitals, and in obtaining the medical histories of the regiments from the surgeons. From Fernandina the board went to Jacksonville, Fla., and studied the condition of the Seventh Army Corps. The plan of investigation adopted at this place was as follows: The first two days were given to the question of the existence of typhoid fever among the citizens of Jacksonville and the surrounding country and a study of the water supply. Details will be found in the body of this report, but it may be stated here that there was no epidemic of typhoid either in the city or in the surrounding country, while this disease prevailed most extensively among the soldiers who were drinking the same water as that used by the citizens. Attention was given especially to the possibility of the water at isolated houses outside the city limits and occasionally visited by soldiers being infected with the typhoid bacillus, and it can be stated without reservation that the epidemic of typhoid fever in the Seventh Army Corps was not due to infected water. After having studied local conditions, one or more surgeons from each regiment was summoned and asked to give the medical history of his command and to state his own views concerning the cause of the epidemic. Later, each regiment and each hospital was visited.

The board then followed the Fourth Army Corps to Huntsville, Ala., and studied each regiment individually.

From Huntsville the board went to Chickamauga Park, which had just been vacated by the First and Third Army Corps. Only a few regiments remained at the park at that time and consequently but few surgeons were seen. This accounts for the differences in the methods by which the matter was worked up in these organizations as compared with others. The board made out its reports upon the regiments of the First and Third Army Corps from the monthly sick reports, both regimental and divisional, and submitted these reports to the medical

officers of the regiments for consideration and criticism. This explains the publication in the report of the lists of probable and recognized cases of typhoid fever in the regiments of the First and Third Army Corps. It should be remarked that the statements of the medical officers, although condemned in many places, have not been modified or altered in any material way. When the surgeon has stated that malaria prevailed in his regiment his statement is inserted, and the same is true of his opinion of the cause of the so-called malaria. For instance, it is claimed by the surgeon of one of the regiments that the cause of the malaria at Chickamauga was the high altitude of that camp. It will be understood, however, that the board does not indorse such a statement. In the first place, the board's studies show most convincingly that there were but few cases of malaria at Chickamauga, and if there had been many cases the board could not indorse the opinion that this disease is caused by high altitude.

The site of the encampment of each regiment at Chickamauga, the intake of the water supply, and each well and spring used by the troops were visited and carefully studied by the board. Attention was also given to the three hospitals remaining at that time in the park. General Boynton, long superintendent of the park and perfectly familiar with every part of the grounds, rendered the board most valuable aid in this work.

From Chickamauga the board went to Knoxville, Tenn., to which place one division had gone from Chickamauga. Here the board was given opportunity of studying an isolated regiment, the Fourth Tennessee, which had never been assigned to any larger encampment. At Knoxville, as at Jacksonville, especial attention was given to the water supply. Some days were spent with the local health authorities and no case of typhoid fever could be found among the citizens of West Knoxville, although the soldiers drinking the same water were suffering severely. It can be stated that the division at Knoxville did not owe its typhoid epidemic to water infection at that place.

The board went from Knoxville to Washington, and later to Montauk Point, N. Y., and later still to Camp Meade, at Middletown, Pa. At Montauk Point the board studied the condition of the Fifth Army Corps which had just returned from Cuba. Observations made at this place are not given in the report, because it was thought best to confine the work to camps occupied by soldiers who had not been outside of the United States. It may be stated here that not only typhoid fever but tropical malaria prevailed among the troops that had participated in the Santiago campaign.

At Camp Meade special attention was given to the question of the disinfection of tentage, clothing, and blankets, and it will be seen that after these measures were carried out and this corps moved to a new camp typhoid fever practically disappeared. This leads the board to emphasize the fact that after typhoid fever has become epidemic in a command the only way to get rid of the infection is to disinfect everything and then move to a new site. Change of location alone is not sufficient to rid a command of typhoid infection. The bacillus in the blankets, in the tentage, and clothing must be destroyed. When this is done, all sick left behind, all new cases isolated promptly and a new location secured, the epidemic ceases.

It will be well for those who consult this report to bear in mind that the order in which the matter is presented in the publication does not follow the itinerary of the board in its tour of inspection. The order of visiting the national encampments, with date of arrival at each, was as follows:

1898: August 20, Camp Alger at Dunn Loring, Va., 7 miles west of Washington.

August 26, camp at Fernandina, Fla.

August 28, Camp Cuba Libre at Jacksonville, Fla.

September 7, camp at Huntsville, Ala.

September 10, Camp George H. Thomas at Chickamauga Park, Ga.

September 14, camp at Knoxville, Tenn.

September 30, Camp Meade, near Harrisburg, Pa.

By reference to the order creating and instructing the board it will be found that one of the duties imposed was to call the attention of the proper commanding officers to any insanitary condition which may exist at the camps visited, and to make recommendations with a view to their proper correction. This was done in writing while at each camp, and it has been thought best to reproduce in this report each of these recommendations, although this necessitates considerable repetition, because these written recommendations express the views held by the board at the time of inspection, and each has something in it bearing on the camps that were being studied.

After the inspection of camps had been concluded the board returned to Washington and began a systematic study of the regimental and hospital sick reports. This work was continued until June, 1900, and it is desirable that a general statement of the manner in which it was done should be made, because the validity of the conclusions reached by the board depends upon the thoroughness with which its investigations were carried out. The plan followed was as follows: From the regimental monthly sick reports every name, with rank and company, was copied and arranged alphabetically in order that there should be no confusion of individuals. Each name was followed by the recorded diagnosis and the disposition of the individual. If the sick man was sent to a division

hospital his history was traced through the records of this hospital, and the same plan was carried out with those sent to general military and civil hospitals. The final disposition of the individual was ascertained whenever possible, but it must be admitted that in a considerable proportion of the cases the incompleteness of the record did not permit of this being done. However, in the great majority of the cases it was possible to trace the individual sufficiently to demonstrate that the illness was a protracted fever. This is shown in the long lists of protracted fevers given in connection with many of the regiments of the First and Third Army Corps. The regiment was taken as the unit and the object has been to ascertain the first case of typhoid in each regiment and then to trace the spread of the disease through the command. However, it has not been the sole object of the board to pick out and enumerate cases of recognized and probable typhoid, but the relation of typhoid to diarrhea, so-called malarias, and all cases so variously diagnosed by the medical officers has been investigated. There has been no little hesitancy as to the wisdom of the publication of the long lists of cases appended to the records of some of the regiments of the First and Third Corps. These lists take up much space, but it has been thought best to include them, because they show exactly how the work was done. However, they do not show the extent and thoroughness of the work, because the published lists show, for the most part, only the cases of protracted fever, while the record of every individual whose name occurs on the monthly sick reports has been traced in the same way, it matters not what the diagnosis or duration of the disease was. This was necessary in order to trace the possible relations between temporary or apparently temporary indispositions and subsequent protracted fevers. This has been investigated in detail in some of the regiments, and the conclusion that transient diarrheas not only did not predispose to typhoid, but gave marked immunity to that disease, because they were due to typhoidal infection, is believed to be one of the most important conclusions reached in the investigation.

The time period, as applied to the regiments, over which the investigations of the board continued is variable. It was at first decided to study each regiment from the date of assembly or muster-in until October 31, 1898, but some of the regiments were furloughed in September and there were no records after that time, while others remained in service and some of the latter presented interesting data of sufficient importance to justify following them through November and December. This was especially true of some of the regiments of the Second Army Corps. By the time the board reached the location of this command at Camp Meade the last day of September, the board itself had learned much, and thorough disinfection of this command was carried out under the direction of Colonel Girard, and it was most gratifying to the board to follow these regiments into their Southern encampment and to find that notwithstanding the fact that the season was most opportune for the prevalence of both malaria and typhoid fever, neither of these diseases, nor in fact any other, was manifest during the fall and winter. The board has regarded this as a demonstration that a way of ridding a command of typhoid infection has been found. It may be interesting to state in this connection that the inspection of camps had a most decided influence on the opinions of the board. They went to Camp Alger believing that they would find some evidence of water infection, but a careful study of the conditions there led to the suggestion that there might be other agencies quite as efficient in the spread of typhoid as water. The study of the conditions prevalent at Jacksonville convinced the board that there at least water was not responsible for the epidemic; then the inspection of the recently abandoned camps at Chickamauga plainly told the truth, and the fact that the most potent factor in the spread of typhoid fever in the camps was the pollution of the soil, of the feet, clothing, bedding, tentage, etc., was made evident, and the necessity for disinfection was pointed out in a way that could not be misunderstood.

In 32 regiments of the Second Army Corps and in 16 regiments of the Seventh Army Corps we have traced the subsequent history of every enlisted man having a short diarrhea or supposed mild malarial attack, in order to see whether these individuals afterwards showed any immunity to typhoid fever. Having endeavored to ascertain with every degree of accuracy within our power the number of cases of typhoid fever in 118 regiments, we found that the data were more or less incomplete in 20. Of the remaining 98 regiments we have charted by company and regiment 84. In 60 of these regiments all cases of typhoid fever, all short and long so-called malarias, and all diarrheas are indicated on the charts according to the date of their occurrence. Of the remaining 24 regiments only cases of typhoid fever are charted.

Bearing on the possibility of infection by personal contact, we have endeavored to locate by tents and in the order of their occurrence every case of typhoid fever which developed in a number of regiments of the Second and Seventh Army Corps, especially in the Fifteenth Minnesota, Thirty-fifth Michigan, Two hundred and third and Two hundred and first New York, and Second New Jersey Volunteer Infantry. These data were furnished largely by the medical officers of these regiments, and in part by the captains of 15 companies of regiments belonging to the Second and Seventh Corps.

It will be readily seen that in prosecuting this work we have assumed a task not only of great magnitude but one beset with many difficulties. The incompleteness of regimental medical records, the changes in the

spelling of names, the giving of wrong initials, and the failure to state rank and company have given us no end of trouble. However, we have spared no pains and we believe that we have not duplicated cases. In the case of men who were furloughed we have carefully searched the reports of mustering-out officers; and in ascertaining the names of those who have died and the cause of death we have resorted to the records of the Adjutant-General's Office. Many men were sent home on hospital trains and were distributed in civil hospitals throughout the country. The medical officers of these hospitals have, as a rule, been kind enough to send us detailed reports giving the name, regiment, rank, company, diagnosis, and termination of each case. In a few instances hospital officials have refused to make such reports, hence we have not secured reports from all the civil hospitals. However, in some of these institutions in which the superior officers have refused to supply us with the desired information, physicians in immediate charge of patients have, at considerable sacrifice of time, made out the desired lists for us. To all of these we wish to express our warmest thanks. We are particularly indebted to Maj. David C. Peyton, surgeon, U. S. Volunteers, for complete reports of sick from the various State and city hospitals of Pennsylvania.

Having ascertained when the first case of typhoid fever appeared in each regiment, we have endeavored to trace the progress of the disease and to account when possible for its spread. Especial attention has been given to the effects of the movements of regiments, the sites of camps, the water supply, and the disposition of fecal matter upon the spread of the disease.

It will be seen that we speak of "recognized" or "certain" and "probable" cases of typhoid fever. The recognized or certain cases need no comment nor explanation. By "probable" we refer to cases which were not recognized by any of the military medical officers as typhoid fever, but which we believe to have been cases of this disease. We have kept these two classes distinct in order that our statistics may not be vitiated by our own ideas. When we began the inspection of camps and hospitals we soon saw that many medical officers were, in our opinion, failing in the recognition of typhoid fever. As has been stated, we asked the Surgeon-General to send to each encampment an expert properly equipped to make blood examinations for the plasmodium of malaria and to apply the Widal test for typhoid fever. It is to be regretted that these examinations were not begun earlier. However, we have been able through these experts to clear up the diagnosis in a large proportion of the cases. In many places our report will apparently be a reflection upon the professional skill of the medical officers. This reflection is, however, more apparent than real. We wish to testify to the fact that the medical officers, both in the volunteer and the regular service, were men of more than average professional ability. It is true that weak men were found in both lines of service, but these were the exceptions and not the rule. The fact that so large a number of most competent medical men left their remunerative practice to devote their time and energy to the service of their country, with most inadequate compensation, must always be accounted to the credit of our profession. In extenuation of the fact that medical officers failed to recognize many cases of typhoid fever, it must be said that the regimental medical officer had the majority of these cases under observation for so short a time that with the means at his command it was quite impossible in a large percentage of the cases to make a positive diagnosis. The rules required that all cases of sickness of forty-eight hours' duration should be sent to the division hospital. This rule is a wise one, and it is unfortunate that it was not always obeyed. It is undoubtedly true that typhoid fever was often spread through a regiment by keeping cases of this disease in quarters or in regimental hospitals, where provision for the disinfection of stools and the care of patients were wholly inadequate, to say nothing of the fact that the time of the regimental medical officer was so occupied with matters pertaining to camp sanitation and with the care of numerous cases of temporary illness that he was not able to give sufficient attention to those sick with typhoid fever. Moreover, regimental medical officers were frequently detached from their commands and placed on duty in division hospitals or elsewhere.

It will be seen from figures to be given later, in which we compare the mortality from typhoid fever in the Army with that from the same disease in civil practice, that the army surgeon in his failure to recognize all cases of typhoid fever showed no greater incapacity than that which is daily shown by physicians in many of the larger cities in our country.

In our list of "probable" cases of typhoid fever it is to be presumed that we have included a few which were not actually cases of this disease. However, we think that the death rate among the cases of probable typhoid fever shows that we have not overestimated the number. Be this as it may, we have endeavored to give every fact that we could obtain concerning each case. We have sought to make this report a full and complete statement of facts, from which we have drawn certain conclusions. The facts are placed before the reader; these he must accept. With our conclusions he may agree or he may draw others to suit himself. In endeavoring to state all the facts, we have made this report somewhat voluminous, but we think we have been justified in doing this. Our sole endeavor has been to get as near the absolute truth as possible.

CHAPTER I.

TYPHOID FEVER IN THE FIRST DIVISION OF THE FIRST ARMY CORPS.

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FIRST ARMY CORPS.

FIRST DIVISION.

Brigade and regiment.	Arrived at Chickamauga.	Strength on arrival.	Left Chickamauga.	Strength on leaving.	No. of cases developed at Chickamauga.	No. of cases developed after leaving Chickamauga.
<i>First Brigade.</i>						
First Kentucky	June 11	1,314	July 26	1,318	22	240
Third Wisconsin	May 15	1,024	July 5	1,313	49	329
Fifth Illinois	May 17	1,066	Aug. 3	1,296	47	78
<i>Second Brigade.</i>						
Fourth Ohio	May 16	887	July 22	1,313	19	-----
Third Illinois	May 17	991	do	1,321	60	486
Fourth Pennsylvania	May 16	640	July 23	1,294	26	-----
<i>Third Brigade.</i>						
Sixteenth Pennsylvania	May 17	628	July 6	865	17	-----
Second Wisconsin	do	1,204	do	1,326	54	275
Third Kentucky	June 2	1,213	July 28	1,293	39	180

SECOND DIVISION.

<i>First Brigade.</i>						
Thirty-first Michigan	May 17	1,019	Aug. 21	1,290	95	144
One hundred and sixtieth Indiana	do	1,023	July 28	1,312	23	200
First Georgia	June 17	1,121	Aug. 21	1,212	85	35
<i>Second Brigade.</i>						
One hundred and fifty-eighth Indiana	May 18	1,023	Aug. 25	1,288	95	33
Sixth Ohio	do	864	Aug. 27	1,299	70	221
First West Virginia	May 20	1,011	Aug. 26	1,298	85	175
<i>Third Brigade.</i>						
First Pennsylvania	May 18	792	Aug. 29	1,071	129	93
Fourteenth Minnesota	do	1,032	do	1,277	114	172
Second Ohio	do	815	Aug. 28	1,297	160	243

THIRD DIVISION.

<i>First Brigade.</i>						
Fifth Pennsylvania	May 20	639	Aug. 23	1,291	182	156
Twelfth Minnesota	do	1,032	do	1,299	320	113
First South Carolina	June 7	-----	July 29	1,163	-----	-----
<i>Second Brigade.</i>						
Eighth Massachusetts	May 20	932	Aug. 23	1,317	55	217
Twenty-first Kansas	do	1,008	Aug. 24	1,264	153	141
Twelfth New York	do	1,023	Aug. 25	1,302	197	293
<i>Third Brigade.</i>						
Second Missouri	May 20	1,040	Aug. 27	1,269	149	119
First New Hampshire	May 22	1,007	Aug. 26	1,296	261	36
Ninth Pennsylvania	May 20	640	do	1,291	287	47

FIRST KENTUCKY VOLUNTEER INFANTRY.

First Brigade, First Division, First Army Corps.

This regiment was mustered into service at Camp Bradley, Lexington, Ky., June 5, 1898. It remained here until June 10, when it departed for Chickamauga Park, Ga., arriving June 11, 1898.

The first report covers the period from June 10 to June 30.

CONDENSED SICK REPORT FROM JUNE 10 TO JUNE 30.

Mean strength	1,314
Intermittent malaria	3
Acute diarrhea	2
Dysentery	2
Enteritis	3
Other diseases	9
Total	19

It seems that this command had a regimental hospital, which was opened June 12.

The June report is signed by Ellis Duncan, captain and assistant surgeon.

The July report is signed by Captain Duncan, who makes the following remarks:

Headquarters, staff, and three battalions of four companies each were in camp at Chickamauga Park, Ga., until July 26. It was en route to Newport News, Va., July 27 and 28, arriving at Newport News, July 28. It remained in camp here during the remainder of this month. Many patients were transferred to the division hospital and subsequently removed from the division hospital to the general hospital on hospital trains. These cases were not reported to the regimental adjutant or regimental surgeon, hence records of such cases are incomplete.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,288
Admissions:	
Remaining from last month	8
From command	77
Total to be accounted for	85

Returned to duty	48
Transferred to other hospitals	22
Otherwise disposed of	1
Completed cases	71
Remaining on sick report:	
Hospital	0
Quarters	14

The August report is signed by J. B. Palmer, major and surgeon, who makes the following remarks:

Lieut. Col. M. B. Belknap, with detachment of six companies, F, H, I, K, L, and M, left Newport News August 1, arriving at Ponce, P. R., August 8; were then sent to Mayaguez, arriving August 10. The hospital was arranged in the barracks; Capt. Ellis Duncan, assistant surgeon, was placed in charge. Col. J. B. Castleman, with detachment of six companies, A, B, C, D, E, and G, left Newport News August 9, arriving at Ponce, P. R., August 16. A hospital was erected near port of Ponce, with Maj. J. B. Palmer, surgeon, and Capt. J. K. Freeman, assistant surgeon, attending. This report contains record of the sick of both detachments. The first detachment marched from Mayaguez August 28, arriving at Ponce August 30. The whole regiment is now in camp about 5 miles to the north of Ponce.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,091
Admissions:	
Remaining from last month	14
From command	46
Total to be accounted for	60
Transferred to other hospitals	50
Completed cases	56
Remaining on sick report:	
Hospital	3
Quarters	1

There is a special report for the detachment which was stationed at the military hospital at Mayaguez from August 13 to 31.

This report is as follows:

Mean strength, not given.	
Admissions from command	5
Total to be accounted for	5
Died	1
Otherwise disposed of	4
Completed cases	5

This report is signed by P. R. Egan, major and brigade surgeon, U. S. Volunteers, in command of the hospital. Major Egan makes no comments.

The September report is signed by Captain Duncan, who makes the following remarks:

The regimental field hospital was located near Ponce during the entire month, Capt. Ellis Duncan, assistant surgeon, being in attendance. Company G was detached and served as mounted infantry on duty at and around Ciales. Capt. J. K. Freeman, assistant surgeon, attended this detachment. Company M was on detached duty as provost guard in Ponce. William R. Kirk, acting assistant surgeon, accompanied this detail. Maj. J. B. Palmer, surgeon of the regiment, was detached and placed in charge of the general hospital at Coamo.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,189
Admissions:	
Remaining from last month	4
From command	210
Total to be accounted for	214
Returned to duty	118
Transferred to other hospitals	67
Completed cases	185
Remaining on sick report:	
Hospital	28
Quarters	1

There is a special report for Company G. This report covers the period from September 18 to 30. Capt. John K. Freeman, in charge, makes the following remarks:

September 18, 1898, Company G, First Kentucky Volunteer Infantry, mounted, was ordered to Utuado for scout duty under orders of Colonel Rice, Sixth Massachusetts Volunteer Infantry. The order gave instructions to report back to the First Kentucky Regiment at Camp Wilson, near Ponce, within ten days. This order was extended September 25 for another ten days. On October 1 the company was ordered to Ciales. Headquarters were established at Utuado. A company was sent out into the neighboring country. The road from Utuado to Arecibo was patrolled to within 4 miles of Arecibo. The health of the company has been excellent.

Private Butler was shot and mortally wounded by Spanish soldiers while guarding a plantation about 4 miles south of Arecibo. The accident grew out of a misunderstanding between the American and Spanish soldiers. Both were at that time guarding property in that neighborhood.

Condensed sick report for Company G.

Mean strength	84
Died	1
Completed cases	1

In the October report the surgeon makes the following statement:

Eight companies of the First Kentucky Volunteer Infantry have been acting as provost guard in Ponce. Company G left camp for Utuado September 19 and did not return to camp during October. Capt. John K. Freeman, assistant surgeon, attended this company. Company E left camp for Cagüas October 13 and has not returned. This company has been without a surgeon. Company F left camp for Cayey October 13 and has not returned. This company was also without a surgeon. Company M left camp for Las Marias October 13 and has not returned. Doctor Hughes, acting assistant surgeon, attended this company. Companies I, K, and L are in barracks at Ponce. Drs. W. R. Kirk and W. A. Carson, acting assistant surgeons, are with these companies. Companies A, B, and D are in other barracks in Ponce. Doctor Kirk has attended these companies also. Companies C and H are in still other barracks in Ponce. Doctor Kirk is in attendance upon these also. The regimental hospital is at Camp Wilson, near Ponce. Doctor Kirk is in attendance. Major Palmer returned from general hospital at Coamo October 28 and took charge of the companies in Ponce.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength, not given.

Admissions:

Remaining from last month	29
From command	110

Total to be accounted for..... 139

Returned to duty..... 61

Transferred to other hospitals..... 65

Completed cases..... 126

Remaining on sick report:

Hospital..... 8

Quarters..... 5

The special report for Company M, at division hospital, Mayaguez, for the month of October, is signed by J. H. McAndrew, without comment.

Condensed sick report for Company M.

Mean strength..... 101

Admissions from command..... 3

Total to be accounted for..... 3

Returned to duty..... 2

Completed cases..... 2

Remaining on sick report:

Hospital..... 1

Quarters..... 0

A special report for Company G for October is signed by Capt. John K. Freeman, who makes the following remarks:

Company G, First Kentucky Volunteer Infantry, mounted, marched from Utuado to Ciales October 1 and 2. Detachments from these companies scouted the vicinity of Ciales and occupied Morovis, Crozal, Naranjito, and Ciales. Headquarters have been established at Ciales. The health of the company is good. Medical supplies were inadequate, as no supplies could be drawn from the regular medical supply depot. Some medicine was ordered of local druggists at Ciales and Crozal. A native physician attended the sick at Crozal.

Condensed sick report for Company G.

Mean strength..... 86

Admissions from command..... 3

Total to be accounted for..... 3

Returned to duty..... 1

Transferred to other hospitals..... 1

Completed cases..... 2

Remaining on sick report:

Hospital..... 1

Quarters..... 0

The November report for this regiment is signed by the surgeon, with the following remarks:

Company G returned to camp November 24, Capt. John K. Freeman in attendance. Company F returned to camp November 26, Dr. A. I. Boyer, acting assistant surgeon, in attendance. Company E and Company M returned to camp November 26, with no surgeons in attendance.

Poison ivy is affecting quite a number of the soldiers. Acetate of lead seems to give the best results in these cases.

CONDENSED SICK REPORT FOR NOVEMBER.

Mean strength, not given.

Admissions:

Remaining from last month..... 13

From command..... 99

By transfer..... 2

Otherwise..... 5

Total to be accounted for..... 119

Returned to duty..... 68

Transferred to other hospitals..... 17

Otherwise disposed of..... 8

Completed cases..... 93

Remaining on sick report:

Hospital..... 14

Quarters..... 12

A special report from the post hospital at Mayaguez for November is signed by Capt. Charles Wilcox, without comment.

Condensed sick report for Company M.

Mean strength, not given.

Admissions remaining from last month..... 1

Total to be accounted for..... 1

Returned to duty..... 1

Completed cases..... 1

A special report for the detachment at Coamo is signed by Dr. A. I. Boyer, acting assistant surgeon, who makes the following statement:

Company F, First Kentucky Volunteer Infantry, was on detached service at Coamo, P. R., from October 12 to November 26. Dr. A. I. Boyer, acting assistant surgeon, U. S. Army, was in attendance from November 5 to 26. This detachment was without a surgeon from October 12 to November 5.

Condensed sick report for Company F.

Mean strength..... 74

Admissions from command..... 9

Total to be accounted for..... 9

Returned to duty..... 7

Transferred to other hospitals..... 2

Completed cases..... 9

A special report for Company G, stationed at Ciales, is signed by Captain Freeman, who makes the following remarks:

This command was relieved by Troop K, Fifth United States Cavalry, November 21. Detachments were called in and the company marched to Ponce and reported to colonel commanding First Kentucky Volunteer Infantry November 24, 1898. The detachments at Corozal and Naranjito were from 15 to 20 miles from Ciales. A native physician was called in to attend the sick and medicine was ordered of local druggists.

Condensed sick report for Company G.

Mean strength	85
Admissions:	
Remaining from last month	1
From command	2
Total to be accounted for	3
Returned to duty	2
Transferred to other hospitals	1

The December report is signed by Major Palmer, who makes the following remarks:

The regiment broke camp near Ponce, P. R., December 3, embarking with 12 companies December 6, on steamship *Berlin*. The regiment arrived at Newport News, Va., December 10, leaving that place December 11. It arrived in Louisville, Ky., December 12. At Louisville the regiment occupied barracks. The entire regiment was furloughed by December 16. The sick were sent to Louisville City Hospital.

CONDENSED SICK REPORT FROM DECEMBER 1 TO 16.

Mean strength, not given.	
Admissions:	
Remaining from last month	22
From command	21
Total to be accounted for	43
Returned to duty	11
Transferred to other hospitals	32
Completed cases	43

The following is a list of the cases of protracted fever in this regiment:

A.—At Chickamauga, Ga.

No. 1. Company B: Intestinal fever, June 19; still sick in division hospital June 30.

No. 2. Company A: Diarrhea, June 25; still sick in division hospital July 31.

No. 3. Company I: Typhoid fever, June 28; sent to Fort Thomas July 6.

No. 4. Company D: Enteritis, June 29 to July 10.

No. 5. Company F: Enteritis, July 1; still sick in Leiter Hospital July 31.

No. 6. Company A: Typhoid fever, July 2; still sick in Leiter Hospital July 31.

No. 7. Company I: Typhoid fever, July 2; sent to Leiter Hospital July 5.

No. 8. Company E: Typhoid fever, July 4; sent to division hospital July 5.

No. 9. Company A: Typhoid fever, July 7; sent to Leiter Hospital July 8.

No. 10. Company E: Typhoid fever, July 8; sent to division hospital July 20.

No. 11. Company B: Typhoid fever, July 9; sent to Leiter Hospital July 10.

No. 12. Company B: Typhoid fever, July 9; sent to division hospital July 9. This man was furloughed from division hospital and returned from furlough still sick with typhoid fever. He was sent to Fort Thomas September 8, and was discharged September 23.

No. 13. Company C: Typhoid fever, July 11; furloughed July 12. Apparently this man returned from furlough, went to Porto Rico, and was sent home on the *Relief*. He was sent to the general hospital at Fortress Monroe November 26, where the disease was diagnosed typhoid fever, and he was furloughed December 2. It would appear from this that he had two attacks of typhoid fever.

No. 14. Company C: Typhoid fever, July 15; sent to division hospital July 18; furloughed August 25.

No. 15. Company H: Typhoid fever, July 15; sent to division hospital July 18; furloughed September 6.

No. 16. Company A: Malaria, July 16; sent to division hospital July 31.

No. 17. Company E: Typhoid fever, July 18; sent to division hospital July 20; transferred to Fort McPherson without date; sent from Fort McPherson to Fort Thomas September 7.

No. 18. Company D: Typhoid fever, July 19; sent to division hospital July 20; returned to duty September 6.

No. 19. Company A: Typhoid fever, July 22; sent to division hospital July 22.

No. 20. Company G: Typhoid fever, July 23; sent to division hospital July 26.

No. 21. Company M: Typhoid fever, July 23; sent to division hospital July 24.

No. 22. Company A: Typhoid fever, July 25; sent to division hospital July 25.

B.—At Newport News, Va.

No. 23. Company C: Typhoid fever, July 30; sent to Fortress Monroe August 1.

No. 24. Company C: Typhoid fever, July 30; sent to Fortress Monroe August 1.

No. 25. Company L: Typhoid fever, July 30; sent to Fortress Monroe August 1.

No. 26. Company M: Typhoid fever, July 30; sent to Fortress Monroe August 1.

No. 27. Company B: Gastritis, August 1; still sick August 31.

No. 28. Company G: Typhoid fever, August 1; sent to Fortress Monroe August 1; transferred to Fort Thomas September 7; returned to duty September 23.

No. 29. Company M: Typhoid fever, August 3; sent to brigade hospital at Mayaguez August 25.

C.—After leaving Newport News, Va.

No. 30. Company I: Typhoid fever, August 4; placed on *Relief* August 10.

No. 31. Company K: Malaria, August 4; sent north on *Relief* August 15.

No. 32. Company L: Typhoid fever, August 4; sent home on *Relief* August 5.

No. 33. Company L: Typhoid fever, August 7; sent home on *Relief* August 5.

No. 34. Company F: Typhoid fever, August 7; sent home on *Relief* August 5.

No. 35. Company A: Typhoid fever, August 7; sent to Fortress Monroe August 9.

No. 36. Company A: Typhoid fever, August 7; sent to Fortress Monroe August 9.

No. 37. Company M: Typhoid fever, August 8; placed on *Relief* August 10.

No. 38. Company H: Typhoid fever, August 8; placed on *Relief* August 10.

No. 39. Company I: Typhoid fever, August 9; placed on *Relief* August 15.

No. 40. Band: Intermittent malaria, August 9; sent to general hospital at Ponce August 21.

No. 41. Company K: Typhoid fever, August 15; sent to hospital at Mayaguez August 25; transferred to hospital ship August 31.

No. 42. Company M: Typhoid fever, August 16; died August 19.

No. 43. Company H: Typhoid fever, August 17; sent to brigade hospital at Mayaguez August 25; transferred to hospital ship August 31; still sick in hospital in Philadelphia October 31.

No. 44. Company M: Typhoid fever, August 19; sent to brigade hospital at Mayaguez August 25; transferred to hospital ship August 31.

No. 45. Company D: Typhoid fever, August 19; sent to general hospital at Ponce August 21.

No. 46. Company A: Typhoid fever, August 19; sent to general hospital at Ponce August 20; transferred to the *Missouri* without date; sent to general hospital at Fortress Monroe October 5; still sick in general hospital December 10.

No. 47. Company B: Remittent malaria, August 20; sent to general hospital at Ponce August 21.

No. 48. Company E: Remittent malaria, August 20; sent to general hospital at Ponce August 21.

No. 49. Company K: Typhoid fever, August 20; disposition not given.

No. 50. Company B: Remittent malaria, August 22; sent to general hospital at Ponce August 23; sent to hospital in Philadelphia September 5. Here the disease was diagnosed typhoid fever, and the patient was discharged October 29.

No. 51. Company A: Remittent malaria, August 23; sent to general hospital at Ponce August 24.

No. 52. Company A: Typhoid fever, August 23; sent to general hospital at Ponce August 27.

No. 53. Company D: Remittent malaria, August 23; placed on *Relief* August 31.

No. 54. Company M: Remittent malaria, August 23; placed on *Relief* August 31.

No. 55. Company M: Typhoid fever, August 23; placed on *Relief* August 31.

No. 56. Company B: Malaria, August 24; sent to general hospital at Ponce September 1.

No. 57. Company F: Remittent malaria, August 30; sent to general hospital at Ponce September 1.

No. 58. Company C: Intermittent malaria, September 1 to 20.

No. 59. Company F: Intermittent malaria, September 1 to 18.

No. 60. Company B: Intermittent malaria, September 2; still sick September 30.

No. 61. Company B: Intermittent malaria, September 2 to 17.

No. 62. Company G: Typhoid fever, September 2; sent to general hospital at Ponce September 4. Later this man was transferred to a hospital in Philadelphia where he was still sick October 31.

No. 63. Company H: Typhoid fever, September 2; sent to general hospital at Ponce September 4.

No. 64. Company M: Typhoid fever, September 2; sent to general hospital at Ponce September 4.

No. 65. Company A: Intermittent malaria, September 3 to 30.

No. 66. Company B: Remittent malaria, September 3; still sick September 30.

No. 67. Company E: Remittent malaria, September 3; still sick in general hospital at Ponce September 30.

No. 68. Company E: Enteritis, September 3 to 22.

No. 69. Company E: Remittent malaria, September 3; still sick in hospital at Ponce September 30.

No. 70. Company M: Remittent malaria, September 3; still sick in hospital at Ponce September 30.

No. 71. Company E: Remittent malaria, September 4; sent to general hospital at Ponce September 7. On October 24 this man was sent to Fort Thomas with remittent malaria and was discharged December 21. In all probability this was a case of malaria.

No. 72. Company L: Intermittent malaria, September 4 to 29.

No. 73. Company L: Intermittent malaria, September 4; sent to general hospital at Ponce October 1.

No. 74. Company M: Remittent malaria, September 4; sent to hospital at Ponce September 7.

No. 75. Company M: Remittent malaria, September 4; sent to hospital at Ponce September 10.

No. 76. Company A: Remittent malaria, September 5; sent to hospital at Ponce September 7.

No. 77. Company K: Intermittent malaria, September 5; sent to general hospital at Ponce September 7. This man was transferred to Fortress Monroe November 19, and was discharged December 10.

No. 78. Company E: Typhoid fever, September 5; sent to general hospital at Ponce September 15.

No. 79. Company E: Remittent malaria, September 5; sent to general hospital at Ponce September 15; transferred to Fortress Monroe October 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed November 10.

No. 80. Company F: Malaria, September 5; sent to general hospital at Ponce September 10.

No. 81. Company F: Intermittent malaria, September 5 to 18.

No. 82. Company I: Remittent malaria, September 5; sent to general hospital at Ponce September 7; transferred to Philadelphia October 5. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 19.

No. 83. Company L: Remittent malaria, September 5; sent to general hospital at Ponce September 15.

No. 84. Band: Diarrhea, September 5 to 19.

No. 85. Company C: Remittent malaria, September 6; sent to general hospital at Ponce September 10; transferred to Philadelphia October 5. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 19.

No. 86. Company not given: Intermittent malaria, September 6; sent to general hospital at Ponce October 4.

No. 87. Company D: Typhoid fever, September 6; sent to general hospital at Ponce September 15.

No. 88. Company I: Intermittent malaria, September 6 to 25.

No. 89. Company M: Typhoid fever, September 6; sent to general hospital at Ponce September 7.

No. 90. Company B: Remittent malaria, September 7; sent to general hospital at Ponce September 7.

No. 91. Company E: Remittent malaria, September 7; sent to general hospital at Ponce September 10.

No. 92. Company E: Remittent malaria, September 7; sent to general hospital at Ponce September 10.

No. 93. Company H: Remittent malaria, September 7; sent to general hospital at Ponce September 10.

No. 94. Company C: Intermittent malaria, September 7; sent to general hospital at Ponce September 10.

No. 95. Company C: Intermittent malaria, September 7 to 18.

No. 96. Company E: Remittent malaria, September 8 to 21.

No. 97. Company L: Remittent malaria, September 8; sent to general hospital at Ponce September 10.

No. 98. Company D: Intermittent malaria, September 10 to 21.

No. 99. Company D: Intermittent malaria, September 10 to October 4.

No. 100. Company D: Diarrhea, September 10 to 21.

No. 101. Company B: Diarrhea, September 11 to 30.

No. 102. Company B: Remittent malaria, September 11 to 26.

No. 103. Company C: Typhoid fever, September 11; sent to general hospital at Ponce September 15.

No. 104. Company C: Intermittent malaria, September 12; sent to general hospital at Ponce September 15.

No. 105. Company H: Typhoid fever, September 12; sent to general hospital at Ponce September 15.

No. 106. Company D: Typhoid fever, September 13; sent to general hospital at Ponce September 20; transferred to Philadelphia October 26. Here the diagnosis was changed to malaria, and the patient was still sick October 31.

No. 107. Company K: Remittent malaria, September 13; sent to general hospital at Ponce September 20.

No. 108. Company A: Remittent malaria, September 14; sent to general hospital at Ponce September 15.

No. 109. Company M: Typhoid fever, September 14; sent to general hospital at Ponce September 16.

No. 110. Company H: Remittent malaria, September 15; sent to general hospital at Ponce October 4.

No. 111. Company K: Remittent malaria, September 16; sent to general hospital at Ponce September 29.

No. 112. Company K: Gastro-enteritis, September 16; sent to Fortress Monroe October 8. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 19.

No. 113. Company G: Typhoid fever, September 17; sent to general hospital at Ponce September 18.

No. 114. Company H: Remittent malaria, September 17; sent to Philadelphia October 5. Here the diagnosis of malaria was continued, and the patient was furloughed October 19.

No. 115. Company D: Diarrhea, September 18 to October 1.

No. 116. Company H: Remittent malaria, September 18; sent to general hospital at Ponce September 23.

No. 117. Company H: Remittent malaria, September 18; sent to Philadelphia October 8. Here the diagnosis of malaria was continued, and the patient was furloughed October 19.

No. 118. Company B: Remittent malaria, September 19; sent to general hospital at Ponce September 29.

No. 119. Company I: Typhoid fever, September 19; sent to general hospital at Ponce September 21.

No. 120. Company F: Intermittent malaria, September 23 to October 7.

No. 121. Company C: Remittent malaria, September 24; sent to general hospital at Ponce September 30.

No. 122. Company B: Intermittent malaria, September 24 to October 17.

No. 123. Company H: Remittent malaria, September 24; sent to general hospital at Ponce September 27.

No. 124. Company E: Intermittent malaria, September 24 to October 14.

No. 125. Company I: Dysentery, September 24; sent to general hospital with out date.

No. 126. Company L: Remittent malaria, September 24; sent to general hospital at Ponce September 29.

No. 127. Company D: Intermittent malaria, September 25 to October 13.

No. 128. Company H: Remittent malaria, September 27; sent to Philadelphia October 26. Here the diagnosis was changed to typhoid fever, and the patient was still sick October 31.

No. 129. Company A: Remittent malaria, September 27; sent to general hospital at Ponce September 29.

No. 130. Company A: Remittent malaria, September 28; sent to general hospital at Ponce September 29.

No. 131. Company C: Remittent malaria, September 28; sent to general hospital at Ponce October 1.

No. 132. Company E: Remittent malaria, September 28; sent to general hospital at Ponce September 29.

No. 133. Company D: Remittent malaria, September 28; sent to general hospital at Ponce October 1.

No. 134. Company C: Intermittent malaria, September 30; sent to general hospital at Ponce October 1.

No. 135. Company D: Remittent malaria, September 30; sent to general hospital at Ponce October 4.

No. 136. Company I: Remittent malaria, September 30; sent to general hospital at Ponce October 1. October 22 the diagnosis was changed to typhoid fever. This man was sent to Fort Thomas November 26. Here the disease was diagnosed malaria, and the patient was still sick December 10.

No. 137. Company C: Remittent malaria, October 1; still sick October 31.

No. 138. Company C: Remittent malaria, October 1; sent to Philadelphia October 8. Here the diagnosis of malaria was continued, and the patient was still sick November 3.

No. 139. Company E: Remittent malaria October 1; sent to Philadelphia October 8. Here the diagnosis of malaria was continued, and the patient was furloughed October 19.

No. 140. Company C: Remittent malaria, October 1; sent to Philadelphia October 26. Here the diagnosis was changed to typhoid fever, and the patient was discharged October 31.

No. 141. Company I: Remittent malaria, October 1; still sick in general hospital at Ponce October 31.

No. 142. Company L: Remittent malaria, October 1; still sick in general hospital at Ponce October 31.

No. 143. Company C: Remittent malaria, October 1; still sick in general hospital at Ponce October 31.

No. 144. Company D: Chronic gastritis, October 1; still sick in general hospital at Ponce October 31.

No. 145. Company D: Diarrhea, October 1 to 12.

No. 146. Company E: Diarrhea, October 1; still sick in hospital October 31.

No. 147. Company G: Typhoid fever, October 2; disposition not given.

No. 148. Company I: Intermittent malaria, October 3 to 14.

No. 149. Company E: Dysentery, October 4; still sick October 31.

No. 150. Company K: Remittent malaria, October 4; still sick October 31.

No. 151. Company C: Diarrhea, October 5; still sick October 31.

No. 152. Company B: Remittent malaria, October 5; sent to general hospital at Ponce November 14.

No. 153. Company D: Typhoid fever, October 5; still sick October 31.

No. 154. Company F: Remittent malaria, October 5; still sick October 31.

No. 155. Company B: Remittent malaria, October 5; sent to Fortress Monroe November 26; here the disease was diagnosed typhoid fever, and the patient was still sick December 10.

No. 156. Company H: Diarrhea, October 5 to 30.

No. 157. Company I: Intermittent malaria, October 5 to 30.

No. 158. Company A: Remittent malaria, October 6; still sick in Hospital October 31.

No. 159. Company H: Remittent malaria, October 6; still sick in hospital October 31.

No. 160. Company L: Intermittent malaria, October 6 to 19.

No. 161. Company B: Malaria, October 8; still sick in hospital October 31.

No. 162. Company D: Remittent malaria, October 8; sent to general hospital at Ponce October 9.

No. 163. Company C: Diarrhea, October 8; sent to general hospital at Ponce October 9.

No. 164. Company B: Remittent malaria, October 9; sent to general hospital at Ponce October 9.

No. 165. Company L: Remittent malaria, October 9; sent to general hospital at Ponce October 10.

No. 166. Company I: Remittent malaria, October 9; sent to general hospital at Ponce October 10; sent to Philadelphia October 26. Here the diagnosis was changed to typhoid fever, and the patient was still sick October 31.

No. 167. Company F: Intermittent malaria, October 10 to 21.

No. 168. Company A: Typhoid fever, October 14; sent to general hospital at Ponce October 19.

No. 169. Company D: Remittent malaria, October 14; sent to general hospital at Ponce October 22.

No. 170. Company C: Remittent malaria, October 16; sent to general hospital at Ponce October 22.

No. 171. Company C: Remittent malaria, October 16; sent to general hospital at Ponce October 22.

No. 172. Company H: Dysentery, October 16 to November 9.

No. 173. Company H: Remittent malaria, October 16; sent to general hospital at Ponce October 23.

No. 174. Company H: Dysentery, October 16; still sick October 31.

No. 175. Band: Remittent malaria, October 16; sent to general hospital at Ponce October 18.

No. 176. Company B: Typhoid fever, October 17; sent to general hospital at Ponce October 20.

No. 177. Company F: Remittent malaria, October 18; still sick October 31.

No. 178. Company I: Remittent malaria, October 18; sent to general hospital October 22.

No. 179. Company D: Diarrhea, October 21; sent to general hospital October 22.

No. 180. Company K: Remittent malaria, October 21; sent to general hospital October 22.

No. 181. Company B: Remittent malaria, October 22; sent to general hospital October 22.

No. 182. Staff: Remittent malaria, October 22; sent to general hospital at Ponce October 27. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 183. Company I: Remittent malaria October 24; sent to general hospital at Ponce October 26.

No. 184. Company L: Intermittent malaria, October 24; sent to officers' hospital at Ponce October 25.

No. 185. Company C: Remittent malaria, October 25; sent to general hospital at Ponce October 27.

No. 186. Company C: Typhoid fever, October 25; sent to general hospital at Ponce October 27.

No. 187. Company I: Diarrhea, October 25; sent to general hospital at Ponce October 28; sent to Fortress Monroe November 26. Here the disease was diagnosed typhoid fever, and the patient was discharged December 29.

No. 188. Company G: Remittent malaria, October 25; sent to San Juan October 27.

No. 189. Company L: Remittent malaria, October 26; still sick November 30.

No. 190. Company I: Remittent malaria, October 27; sent to general hospital at Ponce October 28.

No. 191. Company K: Remittent malaria, October 28; sent to general hospital at Ponce October 28.

No. 192. Company B: Intermittent malaria, October 29; still sick November 30.

No. 193. Company I: Intermittent malaria, October 30; still sick November 30.

No. 194. Company I: Diarrhea, October 31; still sick November 30.

No. 195. Company L: Remittent malaria, October 31; still sick November 30.

No. 196. Company B: Remittent malaria, November 1 to 24.

No. 197. Company C: Remittent malaria, November 1 to 23.

No. 198. Company K: Intermittent malaria, November 1 to 13.

No. 199. Company C: Intermittent malaria, November 1; sent home on hospital ship *Berlin* November 1.

No. 200. Company A: Remittent malaria, November 1; sent home on hospital ship *Berlin* November 1.

No. 201. Company B: Typhoid fever, November 1; sent home on hospital ship *Berlin* November 1.

No. 202. Company A: Remittent malaria, November 1; sent home on hospital ship *Berlin* November 1.

No. 203. Company C: Remittent malaria, November 1; sent home on hospital ship *Berlin* November 1.

No. 204. Company K: Diarrhea, November 2; sent to general hospital at Ponce November 7.

No. 205. Company L: Diarrhea, November 2 to 17.

No. 206. Company D: Diarrhea, November 3; sent to general hospital at Ponce November 7; sent to Philadelphia November 26. Here the diagnosis was changed to malaria, and the patient was still sick December 10.

No. 207. Company H: Intermittent malaria, November 11; sent to officers' hospital at Ponce without date.

No. 208. Company C: Diarrhea, November 12 to 17.

No. 209. Company H: Remittent malaria, November 17; sent to general hospital at Ponce November 17.

No. 210. Band: Remittent malaria, November 21; sent to general hospital at Ponce November 21.

No. 211. Company K: Intermittent malaria, November 25; still sick November 30.

No. 212. Band: Remittent malaria, November 26; sent to general hospital at Ponce November 26.

No. 213. Company B: Intermittent malaria, November 28; still sick when the regiment left Porto Rico.

No. 214. Company K: Intermittent malaria, November 28; still sick when the regiment left Porto Rico.

No. 215. Company K: Remittent malaria, November 28; still sick when the regiment left Porto Rico.

No. 216. Company L: Remittent malaria, November 28; still sick when the regiment left Porto Rico.

No. 217. Company B: Intermittent malaria, November 30; still sick when the regiment left Porto Rico.

No. 218. Company A: Intermittent malaria, December 1; sent to City Hospital at Louisville December 12.

No. 219. Company not given: Intermittent malaria, December 2; sent to City Hospital at Louisville December 12.

No. 220. Company G: Remittent malaria, December 2; sent to City Hospital at Louisville December 12.

No. 221. Company E: Intermittent malaria, December 2; sent to City Hospital at Louisville December 12.

No. 222. Company E: Intermittent malaria, December 2; sent to City Hospital at Louisville December 12.

No. 223. Company I: Convalescing from typhoid fever, December 4; disposition not given.

No. 224. Company I: Intermittent malaria, December 4; sent to City Hospital at Louisville December 12.

No. 225. Company I: Intermittent malaria, December 5; sent to City Hospital at Louisville December 13.

No. 226. Company L: Intermittent malaria, December 6; sent to City Hospital at Louisville December 12.

No. 227. Company B: Intermittent malaria, December 8; sent to general hospital at Fortress Monroe December 10.

No. 228. Company M: Intermittent malaria, December 8; sent to Fortress Monroe December 10.

No. 229. Company B: Intermittent malaria, December 8; sent to hospital at Fortress Monroe December 10.

No. 230. Company A: Intermittent malaria, December 8; sent to general hospital at Fortress Monroe December 10.

No. 231. Company F: Remittent malaria, December 8; sent to general hospital at Fortress Monroe December 10.

No. 232. Company M: Remittent malaria, December 10; sent to general hospital at Fortress Monroe December 10.

No. 233. Company C: Intermittent malaria, December 14; sent to City Hospital at Louisville December 14.

No. 234. Company D: Intermittent malaria, December 14; sent to City Hospital at Louisville December 14.

Besides the above, the following are cases from this regiment that were sent to hospitals in the United States and whose names do not appear on the records sent from Porto Rico:

No. 235. Company B: Typhoid fever, September 3; still sick October 14.

No. 236. Company M: Malaria, October 8; furloughed from Philadelphia October 19.

No. 237. Company B: Malaria, August 30; discharged September 18.

No. 238. Company D: Malaria, October 5; still sick November 3.

No. 239. Band: Malaria, November 26; still sick December 10.

No. 240. Company F: Dysentery, November 26; discharged from hospital December 6.

No. 241. Company I: Malaria, October 26; still sick in hospital October 31.

No. 242. Company G: Malaria, October 25; still sick December 10.

No. 243. Company M: Malaria, October 5; furloughed from hospital October 19.

No. 244. Company M: Malaria, October 5; still sick in hospital November 3.

No. 245. Company B: Malaria, August 30; still sick September 15.

No. 246. Company H: Typhoid fever, October 23; still sick at Fortress Monroe December 10.

No. 247. Company C: Typhoid fever, October 26; still sick at Fortress Monroe December 10.

No. 248. Company C: Typhoid fever, October 27; still sick at Fortress Monroe December 10.

No. 249. Company B: Typhoid fever, October 21; furloughed from Fortress Monroe December 4.

No. 250. Company I: Typhoid fever, September 1; discharged from Fortress Monroe November 10.

No. 251. Company I: Typhoid fever, October 5; still sick at Fortress Monroe December 10.

No. 252. Company D: Typhoid fever, October 31; discharged from Fortress Monroe December 10.

No. 253. Company F: Typhoid fever, September 17; discharged from Fortress Monroe November 10.

No. 254. Company I: Typhoid fever, September 6; discharged from Fortress Monroe November 10.

No. 255. Company D: Typhoid fever, September 18; discharged from Fortress Monroe November 3.

No. 256. Company I: Typhoid fever, October 7; discharged from Fortress Monroe December 4.

No. 257. Company K: Typhoid fever, October 31; discharged from Fortress Monroe December 10.

No. 258. Company D: Typhoid fever, October 22; discharged from Fortress Monroe December 29.

No. 259. Company D: Typhoid fever, November 6; still sick at Fortress Monroe December 31.

No. 260. Company A: Typhoid fever, August 26; discharged from Fort Thomas September 23.

No. 261. Company M: Typhoid fever, September 10; discharged from Fort Thomas September 23. This man evidently had been sick elsewhere and had been transferred to Fort Thomas.

No. 262. Company H: Typhoid fever, November 11; discharged from Fort Thomas November 23. This man had been taken ill at Chickamauga—date not given.

SUMMARY.

Assembled at Camp Bradley, Lexington, Ky.	
Mustered into United States service June 5, 1898.	
Reached Chickamauga Park, Ga., June 11, 1898.	
Mean strength on arrival, 1,314.	
Date of first case of probable typhoid fever, June 19, 1898.	
Date of first case of recognized typhoid fever, June 28, 1898.	
Left Chickamauga Park, July 26, 1898.	
Strength at departure, 1,318.	
Number of cases of probable typhoid fever developed at Chickamauga	22
Arrived at Newport News, Va., July 28, 1898.	
Left Newport News:	
(a) Six companies (F, H, I, K, L, and M) August 1.	
(b) Six companies (A, B, C, D, E, and G) August 9.	
Number of cases of probable typhoid fever developed in the regiment at Newport News	7
Reached Porto Rico:	
(a) First detachment, August 8, 1898.	
(b) Second detachment, August 16, 1898.	
Number of cases developed during the voyage to Porto Rico:	
(a) In first detachment	6
(b) In second detachment	0
Number of cases of protracted fever developed in the regiment in Porto Rico:	
During August	19
During September	80
During October	59
During November	24
From December 1 to 6	8
Left Porto Rico December 6, 1898.	
Arrived at Newport News, Va., December 10, 1898.	
Protracted fevers developed during return voyage	6
Protracted fevers developed after reaching United States	3
Total cases found reported in regimental records	234
Additional cases found in hospital records but not given in regimental records	28
Total cases of protracted fever reported in this regiment.	262

These 262 cases of protracted fever reported in this regiment were diagnosed as follows:

Typhoid fever	88
Malaria	147
Diarrhea	16
Intestinal fever	1
Enteritis	3
Gastritis	2
Dysentery	5
Total	262

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Ackerville, Wm. F.	Pvt., E.	Nov. 10 1898.	Louisville, Ky.	Erysipelas.
Anderson, Joseph	Pvt., I.	July 11	Leiter Hospital, Ga.	Typhoid.
Amyx, Huston S.	Pvt., A.	Oct. 19	Ponce, P. R.	Do.
Bailey, Homer M.	Pvt., B.	Oct. 26	do	Do.
Butler, George C.	Pvt., G.	Sept. 27	Arecibo, P. R.	Wounds.
Brooks, Jesse N.	Pvt., K.	Aug. 27	Rio Grande River, P. R.	Drowned.
Close, Richard	Pvt., M.	Aug. 19	do	Typhoid.
Cole, Marshall	Pvt., C.	Oct. 7	Ponce, P. R.	Do.
Cox, Vincent T., jr.	Pvt., C.	Oct. 25	do	Do.
Clare, Richard	Pvt., M.	Aug. 29	Mayaguez, P. R.	Do.
Dean, Stonewall J.	Pvt., H.	Oct. 27	Philadelphia, Pa.	Do.
Demarce, Harry N.	Pvt., A.	Aug. 21	do	Do.
Davis, George B.	Corpl., I.	Dec. 1	San Juan, P. R.	Do.
Farmer, Frank W.	Pvt., I.	Sept. 29	Ponce, P. R.	Do.
Ganote, Wm. J.	Pvt., B.	Jan. 28 1899.	Okolona, Ky.	Paralysis of heart.
Hanlon, Peter	Pvt., K.	Dec. 24 1898.	Louisville, Ky.	Dysentery.
Haskell, Edward T.	Pvt., G.	Jan. 2 1899.	do	Pneumonia.
Hess, David	Pvt., G.	Feb. 6	Morgansville, Ky.	Cerebro-spinal meningitis.
Hooke, Frank T.	Pvt., E.	Dec. 23 1898.	Louisville, Ky.	Pneumonia.
Johnson, Harry P.	Pvt., E.	Nov. 1	Cayey, P. R.	Gastritis, acute.
Jones, John W.	Pvt., L.	Oct. 23	Ponce, P. R.	Typhoid.
Krell, Harry C.	Sgt., K.	Sept. 7	San German, P. R.	Do.
Ott, George L.	Pvt., M.	Sept. 22	Ponce, P. R.	Do.
Parsons, Horace S.	Pvt., E.	Jan. 21 1899.	Louisville, Ky.	Do.
Rowley, Harry M.	Sgt., C.	Dec. 27 1898.	do	Tropical dysentery.
Reynolds, Frank	1stsgt., D.	Oct. 28	Ponce, P. R.	Typhoid.
Simons, Joseph L.	Pvt., D.	Aug. 30	do	Do.
Sands, Joseph H.	Pvt., B.	Dec. 29	Simpson Hospital, Va.	Do.

Total deaths	28
Deaths due to typhoid fever	18

Percentage of deaths among cases of protracted fever (262), 6.87.

Percentage of deaths figured on recognized cases of typhoid fever (88), 20.45.

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST KENTUCKY VOLUNTEER INFANTRY.

Medical officers.

Jack B. Palmer, major and surgeon, Louisville, Ky.

John K. Freeman, captain and assistant surgeon, Louisville, Ky.

Captain Freeman makes a statement from which we abstract the following:

The site at Lexington, Ky., was well drained, covered with thick blue-grass sod, and supplied with water from a cistern and wells on the ground. A portion of the water was obtained from the Lexington supply. The sinks were about 300 yards from the camp. They were dug to a depth of about 8 feet. Every morning straw was thrown in and burned. After this, enough earth was added to keep everything dry. The kitchens were about 200 yards from the sinks. All garbage was kept in barrels and removed three times a day.

At Chickamauga the tents were pitched in the northern part of the park. The streets were covered with gravel. Each battalion dug a sink from 300 to 400 yards east of the tents. Sinks were dug about 10 feet deep, sheltered with boards, and the contents were covered every morning with sufficient earth to keep everything dry. As soon as a sink was filled it was abandoned and a new one dug. The kitchens were well kept. All slops were thrown into kitchen sinks, and the garbage was burned. The water supply was obtained from wells and from Chickamauga Creek.

From Chickamauga the regiment moved to Newport News, Va., preparatory to embarking for Porto Rico. It camped at the mouth of the James River near the city. This camp was without shade or grass, hot and sandy. Men were quartered in shelter tents. Sinks were dug north of the camp, but quite near, on account of lack of space. They received the same attention as they did at Chickamauga. On August 1 this camp was broken, half of the regiment embarking on the transport *Hudson*, while the remainder moved into a little park within the city. The second portion of the regiment left Newport News August 9 and arrived at Ponce, P. R., August 16. Here it occupied a camp about 1 mile from the plaza for two days. This was on swampy land and the mosquitoes were almost unbearable. Little care was given to the sinks in this camp. Water was obtained from an aqueduct which supplies the city of Ponce. Two days later the regiment was moved to the hills north of Ponce. At this place the camp was arranged especially for the comfort of the men. Sinks were dug several hundred yards from the tents and kept in good condition. The kitchen garbage was buried. The tents were floored after the regiment had been encamped for about three weeks. No tents were ditched at any time. The two halves of the regiment were not united until August 29, when the detachment which first went to Porto Rico joined the second detachment on the hills near Ponce. After this the whole regiment remained here until September 18, when four companies were mounted and sent into the interior. The remaining eight companies were later quartered in such houses as could be rented in the city of Ponce for that purpose. The houses were comfortable and the men not crowded. Here the ordinary privy vaults were used.

THIRD WISCONSIN VOLUNTEER INFANTRY.

First Brigade, First Division, First Army Corps.

In the May report of this regiment, Maj. John B. Edwards, surgeon, makes the following statement:

The health of the command has been very good. The diseases have been principally diarrhea and other digestive disturbances, with some affections of the respiratory tract, due in the main to the change in the manner of living and the heat.

CONDENSED SICK REPORT FROM MAY 11 TO 31, INCLUSIVE.

Mean strength	1,024
Diarrhea.....	27
Dysentery.....	6
Other diseases.....	81
Total	114

In the June report Major Edwards makes the following statement:

There has been no material difference in the health of this command during the months of May and June. The command being larger and the result of vaccination have both contributed to swell the number of reported cases. Several cases of typhoid fever developed during June. I was unable to determine its origin.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,119
Typhoid fever.....	6
Malaria.....	20
Diarrhea.....	16
Dysentery.....	4
Enteritis.....	1
Other diseases.....	59
Total	106

In the July report, Major Edwards states as follows:

This command left Camp Thomas, Chickamauga Park, Ga., July 5, 1898, for Charleston, S. C. Quite a number of cases of typhoid fever had developed and were occurring at that time. All sick were left behind. The quarters in Charleston were not the best from a sanitary point of view. A number of typhoid fever cases occurred there between the 6th of July, the date of our arrival, and the 20th of July, the date of our departure. Quite a large number of malarial cases developed during the same time.

July 20 this command sailed for the island of Porto Rico and arrived and disembarked at Ponce July 27 and 28. Some cases, both typhoid and malaria, developed on board ship.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,318
Typhoid fever.....	15
Malaria.....	22
Undetermined fever.....	32
Diarrhea.....	3
Dysentery.....	1
Enteritis.....	4
Other diseases.....	49
Total	126

In the August report Major Edwards makes the following statement:

This command remained in camp near Ponce, P. R., until August 7, when it moved toward San Juan on the military road and arrived at a point 1 mile beyond Coamo August 10. August 13 it moved one-half mile farther up the road and is now encamped at the latter place. There has been a large increase of sickness, especially in this camp. The diseases are principally fever (malarial), some typhoid cases, disturbances of the digestive tract, acute diarrhea being the principal trouble, a moderate proportion of the cases showing a decided tendency to become chronic; very few of the men have entirely escaped. It has been impossible to determine the precise cause; it has been attributed to a variety of causes and is probably due to the condition of the climate and lack of variety of food—these, in my opinion, being the chief causes. I have had some difficulty in getting necessary medical supplies during this month.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,306
Typhoid fever.....	22
Malaria.....	132
Undetermined fever.....	30
Diarrhea.....	44
Enteritis.....	7
Dysentery.....	3
Gastritis.....	1
Other diseases.....	61
Total	300

The following is a list of the cases of protracted fever in this regiment:

A.—At Chickamauga, Ga.

- No. 1. Company G: Diarrhea, May 24 to June 9.
- No. 2. Company C: Diarrhea, May 28; still sick in division hospital June 30. There is no further record of this case.
- No. 3. Company C: Dysentery, May 28; sent to Fort Thomas July 6; returned to duty October 31. At Fort Thomas this case was recognized as a case of typhoid fever.
- No. 4. Company D: Diarrhea, May 29 to June 9.
- No. 5. Company I: Diarrhea, May 29; still sick June 30. There is no record of this man having been returned to duty at any time.
- No. 6. Company F: Dysentery, May 29; still sick June 30.
- No. 7. Company D: Diarrhea, May 30; still sick June 30.
- No. 8. Company D: Diarrhea, May 30; still sick June 30.
- No. 9. Company M: Dysentery, May 30; still sick June 30.
- No. 10. Company I: Diarrhea, May 31; still sick June 30.
- No. 11. Company D: Diarrhea, May 31; still sick June 30.
- No. 12. Company G: Diarrhea, June 2 to 13.
- No. 13. Company G: Diarrhea, June 2; still sick in division hospital June 30.
- No. 14. Company M: Remittent malaria, June 4; still sick in division hospital June 30.
- No. 15. Band: Dysentery, June 5 to 15.
- No. 16. Company K: Diarrhea, June 5; sent to division hospital June 9. Here the patient was kept under the diagnosis of diarrhea until July 6, when he was forwarded to Fort Thomas. At Fort Thomas the case was diagnosed typhoid fever, and the patient was returned to duty September 9.
- No. 17. Company M: Remittent malaria, June 6; still sick in division hospital June 30.
- No. 18. Company D: Undetermined fever, June 7; sent to division hospital June 11; transferred to Fort Thomas July 6. At Fort Thomas the disease was diagnosed typhoid fever, and the patient was reported for duty October 1.
- No. 19. Company E: Dysentery, June 7; still sick in division hospital June 30.
- No. 20. Company C: Typhoid fever, June 8; sent to division hospital June 11. There is no further record of this case.
- No. 21. Company D: Diarrhea, June 9; still sick in division hospital June 30.
- No. 22. Company I: Diarrhea, June 9; still sick in division hospital June 30.
- No. 23. Company D: Undetermined fever, June 11; sent to division hospital June 11; transferred to Fort Thomas July 6. Here the disease was diagnosed typhoid fever, and the patient was returned to duty October 1.
- No. 24. Company D: Typhoid fever, June 12; sent to Fort Thomas July 6; returned to duty October 16.
- No. 25. Company L: Undetermined fever, June 15; sent to division hospital July 5; here the disease was diagnosed typhoid fever, and the patient was furloughed August 20.
- No. 26. Company L: Remittent malaria, June 15 to 28.
- No. 27. Band: Typhoid fever, June 16; still sick in division hospital June 30.
- No. 28. Company L: Undetermined fever, June 16; sent to division hospital June 22. There is no further record of this case.
- No. 29. Company G: Typhoid fever, June 17; sent to division hospital July 1. There is no further record of this case.
- No. 30. Company F: Diarrhea, June 19 to July 4.
- No. 31. Company H: Typhoid fever, June 20; furloughed from Leiter Hospital July 21.
- No. 32. Company C: Typhoid fever, June 20; still sick in Leiter Hospital June 30.
- No. 33. Company E: Intermittent malaria, June 20; still sick in division hospital July 31.
- No. 34. Company C: Undetermined fever, June 20 to August 17. In Leiter Hospital this case was diagnosed typhoid fever.

No. 35. Company D: Undetermined fever, June 23; still sick in division hospital July 31.

No. 36. Company H: Enteritis, June 23; sent to Fort Thomas July 5; here the disease was diagnosed typhoid fever, and the patient was returned to duty July 19.

No. 37. Company not given: Intermittent malaria, June 24; still sick July 31.

No. 38. Company H: Typhoid fever, June 24; sent to division hospital June 20. There is no further record of this case.

No. 39. Company D: Remittent malaria, June 24; still sick in division hospital July 31.

No. 40. Company K: Typhoid fever, June 26; disposition not given.

No. 41. Company I: Dysentery, June 26; still sick July 31.

No. 42. Company M: Remittent malaria, June 26; transferred from division hospital to Fort Thomas July 6. At the latter place the disease was diagnosed typhoid fever, and the patient was returned to duty September 23.

No. 43. Band: Diarrhea, June 28; still sick July 31.

No. 44. Company K: Undetermined fever, July 1; sent to Fort Thomas July 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 18.

No. 45. Company I: Undetermined fever, July 2; sent to Fort Thomas July 5. Here the disease was diagnosed typhoid fever. The ultimate disposition of this patient has not been ascertained.

No. 46. Company A: Typhoid fever, July 3; died in division hospital July 13.

No. 47. Company D: Diarrhea, July 3; sent to Fort Thomas July 6. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 4.

No. 48. Company C: Sent to Fort Thomas July 6 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was returned to duty October 31.

No. 49. Company M: Sent to Fort Thomas July 6 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was returned to duty October 31.

B.—At Charleston, S. C.

No. 50. Company I: Typhoid fever, July 7; sent to the infirmary at Charleston July 20. We have no records of the infirmary at Charleston, consequently the further history of this and other cases sent to this place is not known.

No. 51. Company L: Undetermined fever, July 8; sent to the infirmary July 20.

No. 52. Company L: Undetermined fever, July 8; sent to infirmary July 20.

No. 53. Company F: Undetermined fever, July 8; sent to the infirmary July 20.

No. 54. Company G: Typhoid fever, July 8; sent to the infirmary July 20.

No. 55. Company F: Undetermined fever, July 8; sent to the infirmary July 20.

No. 56. Company I: Undetermined fever, July 8; sent to hospital at Newport News July 31.

No. 57. Hospital steward: Typhoid fever, July 8; sent to the infirmary July 20.

No. 58. Company K: Intermittent malaria, July 9; sent to the infirmary July 20.

No. 59. Company H: Typhoid fever, July 10; sent to the infirmary July 20.

No. 60. Company I: Undetermined fever, July 11; sent to the infirmary July 20.

No. 61. Company I: Typhoid fever, July 11; sent to the infirmary July 20.

No. 62. Company F: Undetermined fever, July 12; sent to Charleston Hospital July 20.

No. 63. Company E: Typhoid fever, July 12; sent to Charleston Hospital July 20.

No. 64. Company L: Undetermined fever, July 12; sent to the infirmary July 20.

No. 65. Company H: Typhoid fever, July 13; furloughed from Charleston Hospital, August 13.

No. 66. Company F: Typhoid fever, July 13; sent to general hospital at Ponce, August 14.

No. 67. Company H: Typhoid fever, July 13; sent to the infirmary July 20.

No. 68. Company K: Undetermined fever, July 13; sent to Charleston Hospital July 20.

No. 69. Company H: Intermittent malaria, July 13; still sick July 31.

No. 70. Company B: Undetermined fever, July 14; sent to Charleston Hospital July 20.

No. 71. Company I: Undetermined fever, July 14; sent to Charleston Hospital July 20.

No. 72. Company I: Undetermined fever, July 14; sent to Charleston Hospital July 20.

No. 73. Company I: Undetermined fever, July 14; sent to Charleston Hospital July 20.

No. 74. Company F: Malaria, July 14; sent to Charleston Hospital July 20.

No. 75. Band: Typhoid fever, July 14; sent to Charleston Hospital July 20.

No. 76. Company C: Diarrhea, July 15; sent to Charleston Hospital July 20.

No. 77. Company D: Malaria, July 15; sent to Charleston Hospital July 20.

No. 78. Company A: Undetermined fever, July 16; sent to Charleston Hospital July 20.

No. 79. Company I: Undetermined fever, July 16; sent to Charleston Hospital July 20.

No. 80. Company H: Typhoid fever, July 17; sent to Charleston Hospital July 20.

No. 81. Company I: Undetermined fever, July 18; sent to Charleston Hospital July 20.

No. 82. Hospital steward: Intermittent malaria, July 19; still sick in Charleston Hospital July 31.

No. 83. Company E: Undetermined fever, July 19; still sick in Charleston Hospital July 31.

No. 84. Company I: Undetermined fever, July 19; still sick in Charleston Hospital July 31.

No. 85. Company E: Undetermined fever, July 19; still sick in Charleston Hospital July 31.

No. 86. Company L: Undetermined fever, July 19; still sick in Charleston Hospital July 31.

No. 87. Company I: Undetermined fever, July 20; still sick in Charleston Hospital July 31.

No. 88. Company H: Undetermined fever, July 20; still sick in Charleston Hospital July 31.

No. 89. Company I: Malaria, July 20; still sick in hospital July 31.

C.—After leaving Charleston, S. C.

No. 90. Company A: Typhoid fever, July 22; sent to Newport News July 30.

No. 91. Company D: Intermittent malaria, July 22; sent to Newport News July 31.

No. 92. Company I: Intermittent malaria, July 24; still sick August 31.

No. 93. Company M: Malaria, July 24; sent to Newport News July 31.

No. 94. Company F: Intermittent malaria, July 25; sent to Newport News July 31.

No. 95. Company C: Undetermined fever, July 25; sent to Newport News July 31.

No. 96. Company E: Intermittent malaria, July 27; sent to Newport News July 31.

No. 97. Company L: Intermittent malaria, July 27; sent to Newport News July 31.

No. 98. Company L: Intermittent malaria, July 27; sent to Newport News July 31.

No. 99. Company K: Undetermined fever, July 28; still sick August 31.

No. 100. Company K: Undetermined fever, July 28; returned to duty August 17.

No. 101. Company K: Undetermined fever, July 28; still sick August 31.

No. 102. Company K: Undetermined fever, July 28; sent to general hospital at Ponce August 16.

No. 103. Company B: Undetermined fever, July 28; sent to general hospital August 16.

No. 104. Company I: malaria, July 29; sent to general hospital at Ponce August 16.

No. 105. Company F: Intermittent malaria, July 30; still sick August 31.

No. 106. Company D: Intermittent malaria, July 30; still sick August 31.

No. 107. Company E: Diarrhea, July 30; still sick August 31.

No. 108. Company F: Undetermined fever, July 30; still sick August 31.

No. 109. Company F: Malarial fever, July 30; sent to the general hospital at Ponce August 16.

No. 110. Band: Typhoid fever, August 1; sent to general hospital at Ponce August 16.

No. 111. Company L: Remittent malaria, August 1; sent to general hospital at Ponce August 16.

No. 112. Company F: Undetermined fever, August 1; sent to general hospital at Ponce August 16.

No. 113. Company L: Remittent malaria August 1; still sick August 31.

No. 114. Company D: Remittent malaria, August 1; still sick August 31.

No. 115. Company L: Remittent malaria, August 1; still sick August 31.

No. 116. Company C: Remittent malaria, August 1 to 13.

No. 117. Company C: Remittent malaria, August 2; sent to general hospital at Ponce August 16.

No. 118. Company A: Diarrhea, August 3; still sick August 31.

No. 119. Company L: Remittent malaria, August 3; sent to general hospital at Ponce August 16.

No. 120. Company A: Undetermined fever, August 3; sent to general hospital August 6.

No. 121. Company A: Undetermined fever, August 3; sent to general hospital August 10.

No. 122. Company D: Typhoid fever, August 3; disposition not given.

No. 123. Company L: Remittent malaria, August 3; still sick August 31.

No. 124. Company D: Malaria, August 3 to 20.

No. 125. Company K: Remittent malaria, August 4; sent to general hospital August 16.

No. 126. Company M: Typhoid fever August 4; sent to general hospital August 16.

No. 127. Company K: Remittent malaria, August 4; still sick August 31.

No. 128. Company E: Undetermined fever, August 6; sent to general hospital August 16.

No. 129. Company H: Undetermined fever, August 6; sent to general hospital August 16.

No. 130. Company C: Typhoid fever, August 6; disposition not given.

No. 131. Company E: Undetermined fever, August 7; sent to general hospital August 16.

No. 132. Company H: Undetermined fever, August 7; sent to general hospital August 16.

- No. 133. Company F: Undetermined fever, August 7 to 31.
- No. 134. Company G: remittent malaria, August 7; sent to general hospital August 16.
- No. 135. Company M: Remittent malaria, August 7; sent to general hospital August 16.
- No. 136. Company E: Undetermined fever, August 7; sent to general hospital August 16.
- No. 137. Company E: Remittent malaria, August 7; sent to general hospital August 16.
- No. 138. Company F: Remittent malaria, August 7; still sick August 31.
- No. 139. Company H: Remittent malaria, August 7 to 21.
- No. 140. Company D: Remittent malaria, August 7; still sick August 31.
- No. 141. Company H: Diarrhea, August 7; sent to general hospital August 16.
- No. 142. Company M: Undetermined fever, August 8; sent to general hospital August 16.
- No. 143. Company H: Undetermined fever, August 8; sent to general hospital August 16.
- No. 144. Company not given: Undetermined fever, August 8; still sick August 31.
- No. 145. Company B: Undetermined fever, August 9; sent to general hospital August 13.
- No. 146. Company G: Typhoid fever, August 9; sent to general hospital August 16.
- No. 147. Company H: Remittent malaria, August 9 to 25.
- No. 148. Company K: Remittent malaria, August 10; still sick August 31.
- No. 149. Company not given: Undetermined fever, August 10; sent to general hospital August 13.
- No. 150. Company H: Undetermined fever, August 11; sent to general hospital August 16.
- No. 151. Company A: Typhoid fever, August 11; sent to general hospital August 13.
- No. 152. Company H: Enteritis, August 11; still sick August 31.
- No. 153. Company D: Diarrhea, August 11; still sick August 31.
- No. 154. Company H: Typhoid fever, August 11; disposition not given.
- No. 155. Company I: Diarrhea, August 12 to 25.
- No. 156. Company E: Remittent malaria, August 12; sent to general hospital August 16.
- No. 157. Company L: Remittent malaria, August 12; still sick August 31.
- No. 158. Company I: Remittent malaria, August 12; still sick August 31.
- No. 159. Company L: Diarrhea, August 12; sent to general hospital August 16.
- No. 160. Company D: Undetermined fever, August 12; sent to general hospital August 16.
- No. 161. Company L: Undetermined fever, August 12; sent to general hospital August 16.
- No. 162. Company L: Gastritis, August 12; sent to general hospital August 16.
- No. 163. Company L: Diarrhea, August 12 to 31.
- No. 164. Company G: Diarrhea, August 12; still sick August 31.
- No. 165. Company M: Typhoid fever, August 12; sent to general hospital August 16.
- No. 166. Company L: Remittent malaria, August 13; still sick August 31.
- No. 167. Company M: Remittent malaria, August 13; still sick August 31.
- No. 168. Company B: Enteritis, August 13 to 26.
- No. 169. Company I: Remittent malaria, August 14; still sick August 31.
- No. 170. Company C: Diarrhea, August 14; still sick August 31.
- No. 171. Company M: Typhoid fever, August 14; sent to general hospital August 23.
- No. 172. Company M: Typhoid fever, August 14; disposition not given.
- No. 173. Company I: Intermittent malaria, August 14 to 26.
- No. 174. Company I: Undetermined fever, August 14; sent to general hospital August 16.
- No. 175. Company A: Remittent malaria, August 14; still sick August 31.
- No. 176. Company I: Diarrhea, August 15 to 25.
- No. 177. Company K: Remittent malaria, August 15 to 28.
- No. 178. Company K: Remittent malaria, August 15 to 31.
- No. 179. Company B: Intermittent malaria, August 15 to 26.
- No. 180. Company D: Remittent malaria, August 15; still sick August 31.
- No. 181. Company H: Typhoid fever, August 15; disposition not given.
- No. 182. Company D: Diarrhea, August 15; still sick August 31.
- No. 183. Company K: Enteritis, August 16; still sick August 31.
- No. 184. Company L: Typhoid fever, August 16; disposition not given.
- No. 185. Company H: Intermittent malaria, August 16; still sick August 31.
- No. 186. Company F: Remittent malaria, August 16; still sick August 31.
- No. 187. Company H: Typhoid fever, August 16; disposition not given.
- No. 188. Company F: Diarrhea, August 16; still sick August 31.
- No. 189. Company F: Typhoid fever, August 16; disposition not given.
- No. 190. Company F: Remittent malaria, August 16; still sick August 31.
- No. 191. Company C: Remittent malaria, August 16 to 28.
- No. 192. Company L: Remittent malaria, August 16; still sick August 31.
- No. 193. Band: Remittent malaria, August 16; still sick August 31.
- No. 194. Company L: Remittent malaria August 16; sent home on the *Missouri* sick with typhoid fever.
- No. 195. Company M: Typhoid fever, August 16; sent to general hospital August 22.
- No. 196. Company K: Diarrhea, August 16; still sick August 31.
- No. 197. Company K: Remittent malaria, August 17 to 31.
- No. 198. Band: Remittent malaria, August 17; still sick August 31.
- No. 199. Company M: Remittent malaria, August 17; still sick August 31.
- No. 200. Company L: Diarrhea, August 17; still sick August 31.
- No. 201. Company A: Remittent malaria, August 17; still sick August 31.
- No. 202. Company C: Remittent malaria, August 17 to 28.
- No. 203. Company M: Remittent malaria, August 17; still sick August 31.
- No. 204. Company A: Remittent malaria, August 17; still sick August 31.
- No. 205. Company F: Diarrhea, August 17; still sick August 31.
- No. 206. Company D: Diarrhea, August 17; still sick August 31.
- No. 207. Company M: Remittent malaria, August 17; still sick August 31.
- No. 208. Company D: Enteritis, August 18; still sick August 31.
- No. 209. Company D: Remittent malaria, August 18; still sick August 31.
- No. 210. Company H: Remittent malaria, August 18; still sick August 31.
- No. 211. Company K: Typhoid fever, August 18; sent to general hospital August 22.
- No. 212. Company K: Remittent malaria, August 18 to 30.
- No. 213. Company D: Remittent malaria, August 19; sent to Philadelphia. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.
- No. 214. Company K: Undetermined fever, August 19; disposition not given.

- No. 215. Company A: Remittent malaria, August 19; still sick August 31.
- No. 216. Hospital corps: Remittent malaria, August 19; still sick August 31.
- No. 217. Company D: Diarrhea, August 19; still sick August 31.
- No. 218. Company L: Remittent malaria, August 19; still sick August 31.
- No. 219. Company B: Undetermined fever, August 19; sent to general hospital August 24.
- No. 220. Company D: Diarrhea, August 20; still sick August 31.
- No. 221. Company E: Remittent malaria, August 20; sent to general hospital August 26.
- No. 222. Company E: Malaria, August 20 to 31.
- No. 223. Company E: Remittent malaria, August 20; still sick August 31.
- No. 224. Company H: Remittent malaria, August 20; still sick August 31.
- No. 225. Company D: Remittent malaria, August 20; sent to Fort-tress Monroe. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 18.
- No. 226. Company F: Remittent malaria, August 20; still sick August 31.
- No. 227. Staff: Diarrhea, August 20; still sick August 31.
- No. 228. Company F: Remittent malaria, August 20; still sick August 31.
- No. 229. Company K: Remittent malaria, August 20; still sick August 31.
- No. 230. Company K: Typhoid fever, August 20; disposition not given.
- No. 231. Company D: Diarrhea, August 20; still sick August 31.
- No. 232. Company E: Diarrhea, August 20; still sick August 31.
- No. 233. Company M: Remittent malaria, August 20; still sick August 31.
- No. 234. Company H: Remittent malaria, August 21; still sick August 31.
- No. 235. Company G: Remittent malaria, August 21; still sick August 31.
- No. 236. Company L: Remittent malaria, August 21; still sick August 31.
- No. 237. Company K: Remittent malaria, August 21; still sick August 31.
- No. 238. Company L: Remittent malaria, August 21; still sick August 31.
- No. 239. Company K: Typhoid fever, August 21; disposition not given.
- No. 240. Company G: Undetermined fever, August 21; disposition not given.
- No. 241. Company K: Remittent malaria, Aug. 21; still sick August 31.
- No. 242. Company A: Remittent malaria, August 21; still sick August 31.
- No. 243. Company H: Remittent malaria, August 21; still sick August 31.
- No. 244. Company G: Undetermined fever, August 21; still sick August 31.
- No. 245. Company G: Remittent malaria, August 22; still sick August 31.
- No. 246. Company L: Diarrhea, August 22; still sick August 31.
- No. 247. Company G: Remittent malaria, August 22; still sick August 31.
- No. 248. Company H: Remittent malaria, August 22; still sick August 31.
- No. 249. Company H: Typhoid fever, August 22; died August 31.
- No. 250. Company L: Remittent malaria, August 22; sent home on *Relief* with typhoid fever.
- No. 251. Company C: Remittent malaria, August 22; still sick August 31.
- No. 252. Company H: Diarrhea, August 22; still sick August 31.
- No. 253. Company F: Remittent malaria, August 22; still sick August 31.
- No. 254. Company L: Remittent malaria, August 22; still sick August 31.
- No. 255. Company L: Diarrhea, August 22; still sick August 31.
- No. 256. Company K: Diarrhea, August 22; still sick August 31.
- No. 257. Company A: Diarrhea, August 22; still sick August 31.
- No. 258. Company L: Typhoid fever, August 22; sent to general hospital August 23.
- No. 259. Company M: Remittent malaria, August 23; still sick August 31.
- No. 260. Company K: Diarrhea, August 23; still sick August 31.
- No. 261. Company L: Diarrhea, August 23; still sick August 31.
- No. 262. Company E: Remittent malaria, August 23; still sick August 31.
- No. 263. Company F: Remittent malaria, August 23; still sick August 31.
- No. 264. Company G: Diarrhea, August 23; still sick August 31.
- No. 265. Company M: Remittent malaria, August 23; still sick August 31.
- No. 266. Company M: Diarrhea, August 23; still sick August 31.
- No. 267. Company M: Remittent malaria, August 23; still sick August 31.
- No. 268. Company A: Remittent malaria, August 23; still sick August 31.
- No. 269. Company D: Remittent malaria, August 23; still sick August 31.
- No. 270. Company I: Remittent malaria, August 24; still sick August 31.
- No. 271. Company C: Diarrhea, August 24; still sick August 31.
- No. 272. Company F: Remittent malaria, August 24; still sick August 31.
- No. 273. Company K: Remittent malaria, August 24; still sick August 31.
- No. 274. Company E: Undetermined fever, August 24; still sick August 31.
- No. 275. Company F: Diarrhea, August 24; still sick August 31.
- No. 276. Company F: Remittent malaria, August 24; still sick August 31.
- No. 277. Company L: Remittent malaria, August 25; still sick August 31.
- No. 278. Company I: Dysentery, August 25; still sick August 31.
- No. 279. Company L: Diarrhea, August 25; still sick August 31.
- No. 280. Company D: Remittent malaria, August 25; still sick August 31.
- No. 281. Company L: Remittent malaria, August 25; still sick August 31.
- No. 282. Company F: Diarrhea, August 25; still sick August 31.
- No. 283. Company C: Typhoid fever, August 25; disposition not given.
- No. 284. Company F: Remittent malaria, August 25; still sick August 31.
- No. 285. Company G: Remittent malaria, August 26; still sick August 31.
- No. 286. Company G: Remittent malaria, August 26; still sick August 31.
- No. 287. Company M: Remittent malaria, August 26; still sick August 31.
- No. 288. Company E: Remittent malaria, August 27; still sick August 31.
- No. 289. Company K: Enteritis, August 28; still sick August 31.
- No. 290. Company F: Remittent malaria, August 28; sent to Philadelphia September 5. Here the disease was recognized as typhoid fever and the patient was discharged October 5.
- No. 291. Company E: Remittent malaria, August 28; sent to Philadelphia. Here the disease was recognized as typhoid fever and the patient was discharged October 31.
- No. 292. Company E: Remittent malaria, August 28; still sick September 30.

No. 293. Company D: Remittent malaria, August 28; still sick September 30.

No. 294. Company B: Remittent malaria, August 28; still sick in hospital August 31.

No. 295. Company B: Remittent malaria, August 28; still sick in hospital August 31.

No. 296. Company M: Remittent malaria, August 28; still sick in hospital August 31.

No. 297. Company K: Remittent malaria, August 28; still sick in hospital August 31.

No. 298. Staff: Remittent malaria, August 28; still sick in hospital August 31.

No. 299. Company G: Remittent malaria, August 29; sent to Fortress Monroe August 31 with typhoid fever; disposition not given.

No. 300. Company E: Undetermined fever, August 29; disposition not given.

No. 301. Company E: Diarrhea August 29; disposition not given.

No. 302. Company E: Remittent malaria, August 30; disposition not given.

No. 303. Company G: Remittent malaria, August 30; disposition not given.

No. 304. Company K: Remittent malaria, August 30; disposition not given.

No. 305. Company E: Undetermined fever, August 31; disposition not given.

No. 306. Company K: Malaria, September 3; sent to Philadelphia Hospital October 8, with typhoid fever; furloughed October 22.

No. 307. Company not given: Malaria, September 3; sent to Philadelphia Hospital October 5. Here the diagnosis was continued as remittent malaria and the patient was furloughed October 18.

No. 308. Band: Malaria, September 3; sent to Philadelphia Hospital October 5. Here the diagnosis of remittent malaria was continued and the patient was furloughed October 20.

No. 309. Company D: Malaria, September 4; sent to Philadelphia Hospital October 8. Here the diagnosis of remittent malaria was continued and the patient was still sick November 2.

No. 310. Company M: Malaria, September 5; sent to Philadelphia Hospital October 8. Here the diagnosis of remittent malaria was continued and the patient was furloughed October 24.

No. 311. Company C: Malaria, September 5; sent to Philadelphia Hospital October 8. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 18.

No. 312. Company E: Malaria, September 5; sent to Fortress Monroe October 8. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 22.

No. 313. Company H: Malaria, September 5; sent to Philadelphia Hospital October 5. Here the diagnosis of remittent malaria was continued and the patient was furloughed October 28.

No. 314. Company G: Malaria, September 5; sent to Fortress Monroe October 5. Here the diagnosis was changed to typhoid fever and the patient was discharged November 15.

No. 315. Company L: Malaria, September 5; sent to Fortress Monroe October 8. Here the diagnosis was changed to typhoid fever, and the patient was discharged November 2.

No. 316. Company M: Malaria, September 5; sent to Fortress Monroe October 5. Here the diagnosis was changed to typhoid fever, and the patient was discharged November 2.

No. 317. Company B: Malaria, September 5; sent to Jefferson Medical College Hospital October 5. Here the diagnosis was changed to typhoid fever, and the patient was discharged convalescent October 5.

No. 318. Company A: Malaria, September 8; the patient was sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was still sick November 12.

No. 319. Company E: Malaria, September 14; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 18.

No. 320. Company not given: Malaria, September 15; sent to Fortress Monroe October 8. Here the diagnosis was changed to typhoid fever; the patient being convalescent was furloughed October 8.

No. 321. Company E: Malaria, September 16; sent to Philadelphia October 8. Here the diagnosis was changed to typhoid fever; patient was still sick November 2.

No. 322. Company K: Malaria September 16; sent to Philadelphia October 8. Here the diagnosis was changed to typhoid fever; patient was furloughed December 23.

No. 323. Company E: Malaria, September 16; sent to Fortress Monroe October 8. Here the diagnosis was changed to typhoid fever; patient was discharged November 2.

No. 324. Company K: Malaria, September 16; sent to Philadelphia October 8. Here the diagnosis of intermittent malaria was continued; patient was furloughed October 22.

No. 325. Company H: Malaria, September 20; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued; patient was still sick November 8.

No. 326. Company E: Malaria, September 20; sent to Philadelphia October 5. Here the diagnosis of remittent malaria was continued; patient was furloughed October 31.

No. 327. Company L: Malaria, September 20; sent to Philadelphia October 5. Here the diagnosis of remittent malaria was continued; patient was furloughed October 16.

No. 328. Company G: Malaria, September 20; sent to Philadelphia October 5. Here the diagnosis was changed to typhoid fever; patient was still sick November 2.

No. 329. Company G: Malaria, September 20; sent to Fortress Monroe October 5. Here the diagnosis was changed to typhoid fever; patient was discharged November 2.

No. 330. Company H: Malaria, September 20; sent to Fortress Monroe October 5. Here the diagnosis was changed to typhoid fever, and the patient was discharged November 2.

No. 331. Company H: Malaria, September 25; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was still sick November 26.

No. 332. Company C: Malaria, September 27; sent to Philadelphia October 8. Here the diagnosis was changed to typhoid fever, and the patient died October 16.

No. 333. Company M: Malaria, September 27; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was still sick November 2.

No. 334. Company F: Malaria, September 27; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 18.

No. 335. Company L: Malaria, September 27; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 21.

No. 336. Company H: Malaria, September 28; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 18.

No. 337. Staff: Malaria, September 29; sent to Philadelphia October 8. Here the diagnosis was changed to subacute enteritis, and the patient was still sick October 30.

No. 338. Company K: Malaria, September 29; Sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 18.

No. 339. Band: Malaria, September 29; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 18.

No. 340. Company D: Malaria, September 30; sent to Fortress Monroe November 28. Here the diagnosis was changed to typhoid fever; further disposition of the patient is not given.

No. 341. Company D: Malaria, September 30; sent to Fortress Monroe November 28. Here the diagnosis was changed to typhoid fever, and the further disposition of the patient is not given.

No. 342. Company E: Malaria, October 1; sent to Fortress Monroe October 8. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 22.

No. 343. Company M: Malaria, October 2; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 19.

No. 344. Company C: Malaria, October 2; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 18.

No. 345. Company M: Malaria, October 2; sent to Philadelphia October 8. Here the diagnosis of remittent malaria was continued, and the patient was furloughed October 18.

No. 346. Company B: Malaria, October 5; sent to Philadelphia Hospital November 19. Here the diagnosis of remittent malaria was continued, and the patient was discharged November 30.

No. 347. Company C: Malaria, October 8; sent to Fortress Monroe without date. Here the diagnosis was changed to typhoid fever, and the patient died October 16.

No. 348. Company C: Malaria, October 8; sent to Fortress Monroe without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 18.

No. 349. Company K: Malaria, October 8; sent to Fortress Monroe without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 22.

No. 350. Company K: Malaria, October 8; sent to Fortress Monroe without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed November 23.

No. 351. Company I: Malaria, October 12; sent to Philadelphia without date. Here the diagnosis of remittent malaria was continued, and the patient was still sick November 26.

No. 352. Company A: Malaria, October 20; sent to Philadelphia November 28. Here the diagnosis was changed to typhoid fever. The ultimate disposition of this patient is not given.

No. 353. Company G: Malaria, October 20; sent to Philadelphia November 28. Here the diagnosis was changed to typhoid fever. The further disposition of this patient is not given.

No. 354. Company G: Malaria, October 20; sent to Fortress Monroe November 28. Here the diagnosis was changed to typhoid fever, and the further disposition of this patient is not given.

No. 355. Company A: Malaria, October 20; sent to Fortress Monroe October 20. Here the diagnosis was changed to typhoid fever, and the further disposition of the patient is not given. Of course the initial date of this case was earlier than October 20.

No. 356. Company H: Malaria, Oct. 24; sent to Philadelphia November 26. Here the diagnosis of remittent malaria was continued, and the patient was still sick in hospital December 26.

No. 357. Company D: Malaria, October 25; sent to Fortress Monroe November 28. Here the diagnosis was changed to typhoid fever, and the patient was discharged December 12.

No. 358. Company A: Malaria, October 26; sent to Philadelphia November 26. Here the diagnosis of intermittent malaria was continued, and the patient was still sick December 26.

No. 359. Company A: Malaria, without date; sent to Episcopal

Hospital, Philadelphia, October 26. Here the diagnosis was changed to typhoid fever, and the patient was discharged October 31.

No. 360. Company A: Malaria, without date; sent to Woman's Hospital, Philadelphia, October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 361. Company A: Malaria, without date; sent to St. Joseph's Hospital, Philadelphia, October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 362. Company A: Malaria, without date; sent to Medical Chirurgical Hospital, Philadelphia, October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 363. Company C: Malaria, without date; sent to St. Joseph's Hospital, Philadelphia, October 26. Here the disease was diagnosed typhoid fever, and the patient was discharged October 29.

No. 364. Company C: Malaria, without date; sent to hospital in Philadelphia October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 365. Company D: Malaria, without date; sent to hospital in Philadelphia October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 366. Company E: Malaria, without date; sent to hospital in Philadelphia October 26. Here the disease was diagnosed typhoid fever, and the patient was discharged October 31.

No. 367. Company not given: Malaria, without date; sent to hospital in Philadelphia October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 368. Company G: Malaria, without date; sent to hospital in Philadelphia October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 369. Company H: Malaria, without date; sent to hospital in Philadelphia October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 370. Company K: Malaria, without date; sent to St. Joseph's Hospital, Philadelphia, October 26. Here the disease was diagnosed typhoid fever, and the patient was discharged October 31.

No. 371. Company H: Malaria, without date; sent to Woman's Hospital, Philadelphia, October 26. Here the disease was diagnosed typhoid fever, and the patient was still sick October 31.

No. 372. Company K: Malaria, without date; sent to Jefferson Medical College, Philadelphia, October 26. Here the disease was diagnosed typhoid fever, and the further disposition of this patient is not given.

No. 373. Company H: Malaria, October 29; sent to Philadelphia Hospital November 26. Here the disease was diagnosed typhoid fever, and the patient was still sick December 5.

No. 374. Company C: Malaria, without date; sent to Philadelphia Hospital November 26. Here the diagnosis of remittent malaria complicated with diarrhea was continued, and the patient was still sick December 6.

No. 375. Company L: Malaria, October 29; sent to Fortress Monroe November 26. Here the disease was diagnosed typhoid fever, and the patient was discharged December 5.

No. 376. Company L: Malaria, October 29; sent to Philadelphia Hospital November 26. Here the diagnosis was changed to typhoid fever, and the patient was still sick December 5.

No. 377. Band: Malaria, November 6; sent to Philadelphia Hospital November 26. Here the disease was diagnosed intermittent malaria complicated with diarrhea, and the patient was still sick December 26.

No. 378. Company H: Malaria, without date; sent to Fortress Monroe November 26. Here the disease was diagnosed typhoid fever, and the patient was discharged December 5.

SUMMARY.

Assembled at camp near Milwaukee, Wis.	
Mustered into United States service May 8, 1898.	
Arrived at Chickamauga Park, Ga., May 15, 1898.	
Strength on arrival, 1,024.	
Date of first case of probable typhoid fever May 24, 1898.	
Date of first case of recognized typhoid fever May 28, 1898.	
Left Chickamauga Park July 5, 1898.	
Strength on departure, 1,313.	
Number of cases of probable typhoid fever developed at Chickamauga	49
Arrived at Charleston, S. C., July 6, 1898.	
Left Charleston, S. C., July 20, 1898.	
Number of cases of probable typhoid fever developed at Charleston	41
Landed at Ponce, P. R., July 27 and 28, 1898.	
Number of cases of probable typhoid fever developed during the voyage from Charleston to Porto Rico	13
Number of cases of protracted fever developed in Porto Rico:	
From July 28-31, 1898	6
During August	197
During September	33
During October	37
From November 1-6	2
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Total number of cases of protracted fever reported in this regiment	378
These 378 cases were diagnosed as follows:	
Typhoid fever	107
Undetermined fever	56
Malaria	152
Diarrhea	50
Dysentery	6
Enteritis	1
Gastritis	6
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Total	378

It is interesting to note that up to the time when this regiment reached Charleston the regimental surgeon had diagnosed only 9 cases of typhoid fever. Our list shows that up to the same time there had been 49 cases of prolonged fever. Supposing that the regimental surgeon's diagnoses were correct, a little more than 18 per cent of the protracted fevers were typhoid fever. From the time of leaving Chickamauga to that of landing at Ponce there were 54 cases of protracted fever, 12 of which were recognized by the regimental surgeon as typhoid fever. From this it would appear that at this time 22 per cent of the protracted fevers were typhoid. In Porto Rico there were 275 cases of protracted fever and 21 of these were diagnosed by the regimental surgeon as typhoid. This would indicate that a little more than 8 per cent of the protracted fevers developed in Porto Rico were typhoid. Certainly a considerable number of the protracted fevers contracted in Porto Rico were malarial. Have we any data from which we may determine the proportion between the typhoid fevers and the malarial fevers among the cases developed in Porto Rico? In answer to this inquiry we may state that 79 cases developed in Porto Rico and diagnosed as malaria by the regimental surgeons were sent to the general hospital at Fortress Monroe and to the civil hospitals in Philadelphia. In

51 of these the diagnosis was changed at these hospitals to typhoid fever, in 27 cases the diagnosis of malaria was continued, and in 1 case it was changed to enteritis. This would indicate that about 64 per cent of the cases developed in Porto Rico and reported as malarial by the regimental surgeons were actually typhoid fever. However, we must not be too ready to draw conclusions from the data given. In the first place we can not assume that the cases sent back to the United States were representative of all the cases that occurred in this regiment in Porto Rico. Some patients were not sent home because they were supposed to be too ill to bear the voyage and others were not sent home because it was believed that they would soon recover where they were. Lastly, we are not absolutely certain of the correctness of the diagnoses made in the hospitals at Fortress Monroe and Philadelphia. It seems that change in diagnosis from malaria to typhoid fever depended somewhat upon the hospital to which the patient was sent. It is a fact which one may verify by inspection of the list of protracted fevers that we have given for this regiment, that in every case of so-called malaria sent from this regiment to Fortress Monroe the diagnosis was changed to typhoid fever, and the malarial plasmodium was found only in cases sent to the Philadelphia hospitals; and should we pursue the investigation further we would find that some of the Philadelphia observers were much more successful in the search for the plasmodium than others were.

In endeavoring to form some estimate of the actual number of cases of typhoid fever developed in this regiment while in Porto Rico, we may state that if the "undetermined fevers" be added to those recognized as typhoid in either regimental or hospital reports we have 97 cases of typhoid fever developed in Porto Rico. It is perfectly safe to assume that a considerable proportion of the other cases were also typhoid fever, but we have no means of determining this proportion with certainty.

We must not fail to observe that the last regimental report from this command was for the month of August and that all the information that we have concerning the sickness of later months is confined to cases sent to the United States on hospital ships. Of course, there were many cases treated in the hospitals of Porto Rico. The number treated there, however, we have not been able to ascertain.

This regiment was in all probability quite widely infected with typhoid fever before it reached Chickamauga. This is evidenced by the fact that 11 cases of probable typhoid fever developed in this regiment within sixteen days after its arrival at Chickamauga. In the light of our present knowledge there can be but little doubt that all of these were cases of typhoid fever, although only one is so diagnosed and that one was incorrectly diagnosed until the patient was sent to Fort Thomas.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bailey, Burt B.....	Corpl., M.	1898, Sept. 12	Ponce, P. R.....	Acute dysentery and typhoid.
Brace, Dwight C.....	Pvt., E.	Sept. 17	.....do.....	Typhoid.
Bartlett, Sumner P....	Corpl., E.	Sept. 9	Coamo, P. R.....	Do.
Casberg, Maurice.....	Pvt., B.	Aug. 5	Fort Monroe, Va.....	Pneumonia.
Chapman, Earl A.....	Pvt., M.	Oct. 8	Sparta, Wis.....	Consumption.
Curtins, Paul.....	Pvt., K.	Aug. 9	Charleston, S. C.....	Typhoid.
Cumming, Charles V....	Corpl., H.	Nov. 9	Ponce, P. R.....	Do.
De Lapp, John W.....	Pvt., D.	Nov. 9	Syracuse, N. Y.....	Do.
Eaton, Frank N.....	Pvt., M.	Nov. 23	La Crosse, Wis.....	Acute dysentery.
Eck, Charles.....	Pvt., E.	May 22	Camp Thomas, Ga.....	Convulsions.
Edwards, George H....	Qm. sgt. H.	Aug. 31	Coamo, P. R.....	Typhoid.
Gates, Daniel W.....	Sgt., A.	July 13	Chickamauga, Ga.....	Do.
Gamble, James H.....	Pvt., F.	Sept. 20	Ponce, P. R.....	Do.
Ganger, Frank.....	Pvt., G.	Oct. 21	.....do.....	Do.
Gedhouse, Fred R.....	Corpl., D.	Oct. 24	Hospital ship <i>Relief</i> ..	Do.
Hetherington, E. W....	Pvt., A.	Oct. 16	Division hospital.....	Do.
Keiley, Thomas L.....	Pvt., I.	Dec. 11	West Superior, Wis....	Do.
Loomis, Frank B.....	Corpl., F.	Sept. 8	Coamo, P. R.....	Do.
Moyer, Miner E.....	Pvt., L.	Nov. 1	Philadelphia, Pa.....	Do.
McArthur, Charles L...	Pvt., L.	Sept. 11	Coamo, P. R.....	Do.
Noyes, Ellis.....	Pvt., A.	Aug. 23	Ponce, P. R.....	Cerebral embolism.
Nolan, Peter R.....	Pvt., L.	Oct. 27	San Juan, P. R.....	Typhoid.
Olson, Halvor.....	Corpl., C.	Oct. 15	Fort Monroe, Va.....	Dysentery.
Roberts, Frank W.....	Pvt., H.	July 31	Charleston, S. C.....	Typhoid.
Smith, Christie H.....	Corpl., K.	1899, Feb. 1	.....	Do.
Swift, Hector R.....	2d Lt., I.	1898, July 22	Charleston, S. C.....	Do.
Stanley, Frank E.....	Corpl., A.	Sept. 6	Ponce, P. R.....	Do.
Sunderlin, Charles....	Pvt., H.	Oct. 2	Coamo, P. R.....	Tumor of brain.
Swanson, Oscar R....	Pvt., L.	Aug. 12	Asomanta, P. R.....	Killed in action.
Thoreson, Alfred G....	Pvt., M.	Oct. 4	Hospital ship <i>Relief</i> ..	Epileptic Convulsions.
Tuecheck, Joseph.....	Pvt., B.	Oct. 18	Ponce, P. R.....	Typhoid.
Turner, James.....	Pvt., H.	Sept. 8	Coamo, P. R.....	Malarial fever.
Vought, Fred J.....	Pvt., L.	Aug. 12	Aibonito, P. R.....	Wounds.
Wagner, Charles.....	Pvt., H.	Oct. 6	Coamo, P. R.....	Typhoid.
Wachter, Edward.....	Pvt., H.	Sept. 18	.....do.....	Do.
Zimmerman, Oscar L...	Pvt., K.	Oct. 15	.....do.....	Do.
Total deaths.....				36
Deaths due to typhoid fever.....				25

Percentage of deaths among total cases of protracted fever (378), 6.61.

Percentage of deaths among recognized cases of typhoid fever (107), 23.36.

FIFTH ILLINOIS VOLUNTEER INFANTRY.

First Brigade, First Division, First Army Corps.

In the May report Lieut. E. W. Ames, in charge, makes the following statement:

The regiment was mustered into service at Camp Tanner, Springfield, Ill., May 7, 1898, and departed for Camp George H. Thomas, Chickamauga Park, Ga., on May 14, arriving at the latter place May 17. Climatic conditions at Camp Tanner were such as to cause much sickness after departure. The hospital was open May 14. Private Roscoe C. Gibbons, of Company L, was found in his quarters on the morning of May 15 in an unconscious condition. He had secured food from a huckster wagon. He died in the regimental hospital the following morning; diagnosis: Ptomain poisoning.

CONDENSED SICK REPORT FROM MAY 14 TO 31, INCLUSIVE.

Mean strength	1,066
Intermittent malaria.....	1
Acute diarrhea.....	5
Ptomain poisoning.....	6
Typhoid fever.....	1
Other diseases.....	36
Total	49

The case of recognized typhoid fever was that of a private in Company L. The initial date of his sickness is given as May 16. The disposition of this case is not stated.

It may be of interest to observe that the case of recognized typhoid fever and that of fatal ptomain poisoning occurred in the same company. As the regiment left Springfield May 14 and reached Chickamauga May 17, it will be seen that the recognized case of typhoid fever developed on the journey, and the disease must have been contracted before leaving Illinois, and the probabilities are that it was contracted before May 7, the time when the regiment was mustered into service.

It will thus be seen that this regiment carried typhoid fever with it to Chickamauga Park. The case of intermittent malaria was off duty for only three days. Another case which might possibly have been typhoid fever is that of a private in Company B. This man was taken ill May 31, and with a diagnosis of undetermined fever was sent to the field hospital of the first division of the First Army Corps.

In the June report Lieutenant Ames makes the following statement:

Mumps and measles were prevalent during the month. The epidemics subsided near the close of the month. Isolation was rigidly enforced. About twenty cases of typhoid fever developed, the diagnosis being confirmed after transfer to the first division hospital. Strict sanitary conditions were secured, and a futile attempt to control huckster traffic, which has infested the camp from the beginning, was made. The epidemic is now subsiding. Lieut. Ezra C. Chacey, of Company E, was granted sick leave and sent to St. Vincent's Hospital, Chattanooga, June 24.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,298
Intermittent malaria.....	2
Malaria.....	2
Acute diarrhea.....	4
Enteritis.....	3
Dyspepsia.....	5
Typhoid fever.....	2
Other diseases.....	69
Total	87

It is interesting to note that while the surgeon in his comments states that 20 cases of typhoid fever developed during the month of June, his report contains only 2 recognized cases. This confirms the fact frequently observed in other regiments that while typhoid fever was known to prevail, the cases were not always recorded with proper diagnosis.

Dyspepsia seems to have been a severe disease in this regiment, and several cases were sent to the hospital for treatment. Some of these, as we shall see later, proved to be typhoid fever. It is quite evident that this regiment brought typhoid fever with it from Springfield, and that early in June it became quite widely infected.

The report for July is signed by Major Kelly, without comment.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,296
Intermittent malaria	6
Acute diarrhea	1
Enteritis	6
Undetermined fever	4
Typhoid fever	13
Other diseases	35
Total	65

The August report is without comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,187
Remittent malaria	15
Enteritis	31
Undetermined fever	42
Typhoid fever	42
Other diseases	13
Total	143

This regiment left Chickamauga Park August 3 and went to Newport News, Va. Later it was transferred to Camp Hamilton near Lexington, Ky. Up to August 17 all of the cases were sent to the general hospital at Fort Monroe, Va. After August 20 cases were sent to the field hospital of the Third Division of the First Army Corps, or to other hospitals at Lexington, Ky.

The September report is without comment.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,262
Remittent malaria	13
Undetermined fever	3
Typhoid fever	27
Other diseases	2
Total	45

Most of the cases of typhoid recognized in this report are brought over from previous months.

Sometime in September, the exact date not known to us, this regiment was transferred to Camp Lincoln, Springfield, Ill. Here it was mustered out of service October 16.

CONDENSED SICK REPORT FROM OCTOBER 1-16, INCLUSIVE.

Mean strength	1,194
Typhoid fever	6
Other diseases	3
Total	9

Of course this report covers only a small detachment.

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

A.—At Chickamauga, Ga.

No. 1. Company L: Typhoid fever, May 16; disposition not given.

No. 2. Company E: Bronchitis, June 8; sent to division hospital June 9. Here the diagnosis was changed to typhoid fever; the further disposition of this patient is not given.

No. 3. Company L: Dyspepsia, June 11; sent to division hospital June 15. Here the diagnosis was changed to typhoid fever, and the further disposition of this patient is not given.

No. 4. Company K: Undetermined fever, June 17; sent to division hospital June 19. Here the diagnosis was changed to typhoid fever, and the patient was returned to duty July 16.

No. 5. Company I: Sent to division hospital without diagnosis June 17. Here the disease was diagnosed typhoid fever. Further disposition of this patient is not given.

No. 6. Company G: Sent to division hospital without diagnosis June 21. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 9.

No. 7. Company H: Sent to division hospital without diagnosis June 26. Here the disease was diagnosed typhoid fever, and the patient is recorded as having been returned to duty July 15. However, it is more than probable that the patient was furloughed at this time.

No. 8. Company G: Sent to division hospital without diagnosis June 27. Here the disease was diagnosed typhoid fever, and the patient was furloughed July 11.

No. 9. Company I: Malaria, June 28; sent to division hospital June 29. Here the diagnosis was changed to typhoid fever, and the patient was furloughed July 11.

No. 10. Company B: Sent to division hospital without diagnosis June 29. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 30.

No. 11. Company F: Sent to division hospital without diagnosis June 29. Here the disease was diagnosed malaria, and the patient was still sick in hospital July 31.

No. 12. Company A: Typhoid fever, July 1; furloughed July 19.

No. 13. Company M: Typhoid fever, July 2; sent to division hospital July 6. Further disposition not given.

No. 14. Company L: Typhoid fever, July 2; sent to division hospital July 4. Further disposition not given.

No. 15. Company K: Typhoid fever, July 4; sent to division hospital July 4. Further disposition not given.

No. 16. Company G: Sent to Leiter Hospital without diagnosis July 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 27.

No. 17. Company M: Typhoid fever, July 7; furloughed July 16.

No. 18. Company F: Typhoid fever, July 11; sent to division hospital July 12. Further disposition not given.

No. 19. Company A: Typhoid fever, July 12; furloughed from division hospital August 8.

No. 20. Company C: Typhoid fever, July 13; sent to St. Vincent's Hospital, Chattanooga, Tenn.

No. 21. Company M: Malaria, July 13; furloughed from division hospital July 22.

No. 22. Company H: Malaria, July 13; still sick in division hospital July 31.

No. 23. Company K: Remittent malaria, July 14; furloughed July 24.

No. 24. Company I: Typhoid fever, July 14; sent to division hospital July 14. Further disposition not given.

No. 25. Company L: Sent to Leiter Hospital without diagnosis July 15. Here the disease was diagnosed typhoid fever, and the patient was returned to quarters August 18.

No. 26. Company K: Sent to division hospital without diagnosis July 15. Here the disease was diagnosed as malaria, and the patient was furloughed September 17.

No. 27. Company K: Typhoid fever, July 15; furloughed July 26. As an evidence of the imperfect way in which the records of this regiment have been kept, it may be interesting to state that the record shows that this man was returned to duty July 26, when in fact he was on furlough and reported still sick at Springfield in September.

No. 28. Company M: Typhoid fever, July 16; sent to division hospital July 17. Further disposition not given.

No. 29. Company E: Malaria, July 17; furloughed July 28.
 No. 30. Company B: Malaria, July 18; furloughed July 28.
 No. 31. Company D: Sent to division hospital without diagnosis July 19. Here the disease was diagnosed malaria, and the patient was still sick July 31.

No. 32. Company I: Malaria, July 19; sent to division hospital July 19. Here the disease was recognized as typhoid fever, and the patient was transferred July 24. The hospital to which this transfer was made is not mentioned.

No. 33. Band: Sent to Leiter Hospital July 19 without diagnosis. Here the disease was diagnosed intermittent malaria, and the patient was furloughed August 1.

No. 34. Company L: Remittent malaria, July 21; sent to division hospital July 23. Here the diagnosis was changed to typhoid fever. The disposition of this patient is not given.

No. 35. Company A: Remittent malaria, July 21; sent to division hospital July 24. Here the diagnosis was changed to typhoid fever, but there is no further record of this case.

No. 36. Company B: Typhoid fever, July 21; sent to St. Vincent's Hospital without date.

No. 37. Company C: Enteritis, July 22; sent to division hospital July 22. Here the diagnosis was changed to typhoid fever, and the further disposition of this patient is not given.

No. 38. Company G: Typhoid fever, July 24; sent to division hospital July 26; transferred to Sternberg Hospital September 6; furloughed October 8.

No. 39. Company L: Typhoid fever, July 29; furloughed from division hospital August 10.

No. 40. Staff: Typhoid fever, July 29; sent to St. Vincent's Hospital without date.

No. 41. Staff: Typhoid fever, July 29; sent to St. Vincent's Hospital without date.

No. 42. Company K: Malaria, July 29; still sick in quarters August 21.

No. 43. Company E: Intermittent malaria, July 30; sent to division hospital July 31. Here the diagnosis was changed to typhoid fever, but there is no further record.

No. 44. Company H: Sent to division hospital without diagnosis July 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 7.

No. 45. Company H: Sent to division hospital without diagnosis August 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 18.

No. 46. Company E: Sent to division hospital without diagnosis August 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 13.

No. 47. Company H: Sent to division hospital without diagnosis August 3. Here the disease was diagnosed typhoid fever, and the patient was returned to quarters August 18.

B.—At Newport News, Va.

No. 48. Company B: Typhoid fever, August 5; sent to Fortress Monroe.

No. 49. Company I: Typhoid fever, August 5; sent to Fortress Monroe.

No. 50. Company K: Typhoid fever, August 5; sent to Fortress Monroe.

No. 51. Company not given: Typhoid fever, August 5; sent to Fortress Monroe.

No. 52. Company M: Typhoid fever, August 5; sent to Fortress Monroe.

No. 53. Company H: Typhoid fever, August 5; sent to Fortress Monroe.

No. 54. Company L: Typhoid fever, August 6; sent to Fortress Monroe.

No. 55. Company I: Typhoid fever, August 7; sent to Fortress Monroe.

No. 56. Company H: Typhoid fever, August 7; sent to Fortress Monroe.

No. 57. Company L: Typhoid fever, August 7; disposition not given.

No. 58. Company H: Typhoid fever, August 7; disposition not given.

No. 59. Company M: Typhoid fever, August 8; sent to Fortress Monroe.

No. 60. Company E: Typhoid fever, August 8; sent to Fortress Monroe.

No. 61. Company A: Typhoid fever, August 8; sent to Fortress Monroe.

No. 62. Company I: Typhoid fever, August 8; sent to Fortress Monroe.

No. 63. Company G: Typhoid fever, August 8; sent to Fortress Monroe.

No. 64. Company D: Typhoid fever, August 10; sent to Fortress Monroe.

No. 65. Company H: Typhoid fever, August 11; sent to Fortress Monroe.

No. 66. Company L: Typhoid fever, August 11; sent to Fortress Monroe.

No. 67. Company not given: Typhoid fever, August 13; sent to Fortress Monroe.

No. 68. Company C: Typhoid fever, August 13; sent to Fortress Monroe.

No. 69. Company I: Typhoid fever, August 13; sent to Fortress Monroe.

No. 70. Company I: Typhoid fever, August 13; sent to Fortress Monroe.

No. 71. Company A: Typhoid fever, August 14; sent to Fortress Monroe.

No. 72. Company G: Typhoid fever, August 15; sent to Fortress Monroe.

No. 73. Company F: Typhoid fever, August 16; sent to Fortress Monroe; discharged December 3.

No. 74. Company I: Typhoid fever, August 16; sent to Fortress Monroe.

No. 75. Company A: Typhoid fever, August 17; sent to Fortress Monroe.

No. 76. Company K: Typhoid fever, August 17; sent to Fortress Monroe.

C.—At Lexington and after returning to Illinois.

No. 77. Company not given: Typhoid fever, August 20; sent to infirmary at Lexington, Ky.

No. 78. Company K: Typhoid fever, August 20; sent to infirmary.

No. 79. Company E: Typhoid fever, August 20; sent to infirmary.

No. 80. Company G: Typhoid fever, August 20; sent to St. Joseph's Hospital, Lexington, Ky.

No. 81. Band: Typhoid fever, August 21; sent to St. Joseph's Hospital.

No. 82. Company D: Typhoid fever, August 21; sent to infirmary.

No. 83. Company K: Typhoid fever, August 21; disposition not given.

No. 84. Hospital Corps: Typhoid fever, August 22; sent to infirmary.

No. 85. Civilian: Typhoid fever, August 22; sent to infirmary.

No. 86. Company not given: Typhoid fever, August 22; sent to infirmary.

No. 87. Company L: Typhoid fever, August 22; sent to Fortress Monroe.

No. 88. Company I: Typhoid fever, August 22; sent to Fortress Monroe.

No. 89. Company I: Typhoid fever, August 22; sent to Fortress Monroe.

No. 90. Company G: Typhoid fever, August 22; sent to Fortress Monroe.

No. 91. Company D: Typhoid fever, August 22; sent to Fortress Monroe.

No. 92. Company not given: Typhoid fever, August 22; sent to infirmary.

No. 93. Company D: Typhoid fever, August 22; sent to St. Joseph's Hospital.

No. 94. Company B: Typhoid fever, August 23; sent to Fortress Monroe.

No. 95. Company D: Typhoid fever, August 23; sent to St. Joseph's Hospital.

No. 96. Company M: Typhoid fever, August 23; sent to Fortress Monroe.

No. 97. Company G: Typhoid fever, August 23; sent to St. Joseph's Hospital.

No. 98. Company I: Typhoid fever, August 24; sent to Fortress Monroe.

No. 99. Company H: Typhoid fever, August 24; sent to Fortress Monroe.

No. 100. Company G: Typhoid fever, August 25; furloughed September 27.

No. 101. Company D: Typhoid fever, August 25; furloughed September 5.

No. 102. Company K: Typhoid fever, August 25; sent to Fortress Monroe.

No. 103. Company H: Typhoid fever, August 25; furloughed September 14.

No. 104. Company M: Typhoid fever August 25; furloughed September 14.

No. 105. Company G: Intermittent and malaria, August 25; furloughed September 17.

No. 106. Company D: Typhoid fever, August 25; furloughed September 11.

No. 107. Company M: Typhoid fever, August 26; died at Fortress Monroe September 9.

No. 108. Company C: Typhoid fever, August 27; sent to infirmary.

No. 109. Company A: Typhoid fever, August 27; sent to Fortress Monroe.

No. 110. Company C: Typhoid fever, August 27; sent to St. Joseph's Hospital.

No. 111. Company L: Typhoid fever, August 27; sent to Field Hospital at Lexington.

No. 112. Company I: Typhoid fever, August 28; sent to division hospital September 3.

No. 113. Company K: Typhoid fever, August 29; sent to division hospital September 3.

No. 114. Company G: Typhoid fever, September 1; sent to division hospital September 3.

No. 115. Company I: Typhoid fever, September 1; sent to division hospital September 2.

No. 116. Company D: Typhoid fever, September 1; sent to division hospital September 3.

No. 117. Company B: Remittent malaria, September 2; still sick in quarters September 26.

No. 118. Company B: Typhoid fever, September 2; sent to military hospital September 2.

No. 119. Company H: Typhoid fever, September 2; sent to military hospital without date.

No. 120. Company not given: Typhoid fever, September 4; sent to Fortress Monroe October 5; discharged December 31.

No. 121. Company not given: Typhoid fever, September 14; sent to military hospital without date.

No. 122. Company not given: Typhoid fever, September 16; sent to military hospital.

No. 123. Company not given: Typhoid fever, September 16; sent to military hospital.

No. 124. Company C: Typhoid fever, September 16; sent to military hospital.

No. 125. Company M: Typhoid fever without date; sent to the infirmary without date.

It will be noticed that after the regiment left Newport News several patients were sent to Fortress Monroe. We have been unable to ascertain whether these were sent from Lexington or came from a detachment left at Newport News.

SUMMARY.

Assembled at Camp Tanner, Springfield, Ill., April 26, 1898.

Mustered into United States service May 7, 1898.

Arrived at Chickamauga Park, Ga., May 17, 1898.

Strength on arrival, 1,066.

Date of first case of probable typhoid fever, May 16, 1898.

Date of first case of recognized typhoid fever, May 16, 1898.

Left Chickamauga Park August 3, 1898.

Strength on departure, 1,296.

Number of cases of probable typhoid fever developed at Chickamauga..... 47

Arrived at Newport News, Va., August 5, 1898.

Left Newport News August 17, 1898.

Number of cases of probable typhoid fever developed at Newport News..... 29

Arrived at Lexington, Ky., August 20, 1898.

Number of cases of probable typhoid fever developed at Lexington from August 20-31, 1898..... 37

Number of cases of probable typhoid fever developed at Lexington, Ky., and at Springfield, Ill., from September 1-16, 1898..... 12

Total number of cases of probable typhoid fever reported from this regiment..... 125

These 125 cases were diagnosed as follows:

Typhoid fever..... 113

Malaria..... 12

Total..... 125

The following is a list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bohnert, Ludwig R....	Pvt., C...	1898. May 28	Camp Thomas, Ga....	Acute ptomain poisoning.
Bosley, Frank C.....	Pvt., G....	May 29	.....do.....	Pneumonia.
Campbell, Wm. S., jr..	Sgt., E....	July 16	Chattanooga, Tenn....	Typhoid.
Cannon, Clarence.....	Pvt., D....	Sept. 3	Fort Monroe, Va.....	Do.
Chiles, Harry.....	Pvt., H....	July 17	.....do.....	Peritonitis.
Cotton, Charles R.....	Pvt., C....	Aug. 19	Camp Thomas, Ga....	Typhoid.
Dixon, Robert G.....	Pvt., G....	Aug. 18	Bloomington, Ill.....	Tuberculosis following croupous pneumonia.
Gibbons, Roscoe C....	Pvt., L....	May 26	Chickamauga, Ga....	Ptomain poisoning.
Gomes, George W.....	Corpl., C.	Aug. 21	Fort Monroe, Va.....	Typhoid.
Mitchell, James.....	Pvt., M....	Sept. 9	.....do.....	Do.
Moffatt, Thomas W....	Pvt., L....	Sept. 25	.....do.....	Do.
Orr, Abner.....	Pvt., B....	Sept. 15	Springfield, Ill.....	Do.
Post, Ally C.....	Pvt., M....	May 31	.....do.....	Pneumonia.
Rucker, Eugene E....	Pvt., B....	July 4	.....do.....	Pleuropneumonia and empyema.
Smith, Hiram A.....	Pvt., M....	Aug. 18	Fort Monroe, Va.....	Typhoid.
York, Jesse J.....	Pvt., C....	June 10	.....do.....	Acute lobar pneumonia.

Total deaths..... 16

Deaths due to typhoid fever..... 8

Percentage of deaths among probable cases of typhoid fever (125), 6.4.

Percentage of deaths among recognized cases of typhoid fever (113), 7.08.

COMMUNICATIONS FROM THE SURGEONS OF THE FIFTH ILLINOIS VOLUNTEER INFANTRY.

Medical officers.

Milton R. Keely, surgeon, Dwight, Ill.
James L. Bevans, assistant surgeon, Decatur, Ill.
Elwin W. Ames, assistant surgeon, Canton, Ill.

Captain and Assistant-Surgeon Bevans states:

My regiment was stationed at Camp Tanner, Springfield, Ill., from April 26 to May 14, 1898. The water supply was from the city mains. An analysis proved it to be good. Water from the wells was condemned and its use forbidden.

The troops were stationed in buildings used for State fair purposes. My own regiment, the Fifth Illinois, occupied cattle sheds and stables. Indoor water-closets were used in part. The indiscriminate use of sheep pens and neighboring hillsides as privies finally necessitated the digging of sinks. These sinks were always filthy in the extreme. There is no doubt but that pneumonia and typhoid were taken by us to Chickamauga from Camp Tanner. The pneumonia was of unusually severe type.

On arrival at Chickamauga, May 15, 1898, we were encamped in a place which had been previously occupied by troops. There were old sinks, partly filled, scattered over the site of our camp. Tents were pitched over places where sinks had been. This state of affairs was remedied as far as possible. Owing to the character of the soil it was hard to make properly constructed sinks, and the clay was not a good substance with which to cover the fecal matter. There was often lack of cooperation on the part of commanding officers of regiments. It was difficult to obtain the services of guards for the sinks. There was no regular, systematic inspection from higher sources than the regiment. Occasionally a division or corps medical officer would visit our camp and make suggestions. Policing of the sinks and inspection of the camp, as far as my own regiment was concerned, was carried out thoroughly, but this was not so with many regiments, and all suffered alike from the faults of the few.

About the middle of June I was detailed for duty at the first division hospital of the First Army Corps. Here the sinks were always neglected. It was due to the fact that an insufficient number of men for the care of the sick were on hand. Much time of officers and men was wasted in carrying out conflicting and confusing orders from the corps surgeon. Letters on file with the records of the hospital will prove that the commanding officers who had charge at various times during the history of the hospital did all they could to call attention of the higher officers to the condition of affairs. Finally, Colonel Hartsuff took personal control of the hospital and brought about a lasting reform. An attempt was made at the disinfection of bedpans in use with typhoid patients, but the sinks were allowed to become almost level full without any attempt at policing. They were then imperfectly covered and new ones dug.

At Newport News, where my regiment went on July 28, the regiment as an organization was supreme. The camp was very small and the medical officers were able to carry out their own views in regard to the care of sinks, inspections, kitchens, and grounds. We suffered much from typhoid fever as a result of our stay in Chickamauga, but the camp was always in good condition.

From Newport News I went to Camp Meade, Pa., as acting surgeon of a battalion of the Sixteenth Pennsylvania, and stayed there from August 17 to September 1. After the lax regulations and inspections to which I had been accustomed in the other camps, the supervision as to sanitary matters at Camp Meade seemed almost tyrannical. There was constant, thorough, systematic inspection from sources higher than the regiment. A sufficient number of guards was provided to watch every sink, and each soldier was compelled to cover his own fecal matter, spades being provided for the purpose. Specific orders were issued as to the use of water, and filters were provided for use. Cooperation of commanding officers in sanitary matters was insisted upon. The slightest neglect in carrying out sanitary regulations in force at the camp was

followed by immediate reprimand of the officer at fault. The condition of the camp was excellent.

At Lexington no observations as to the sanitary conditions were made on account of my very short stay.

FOURTH OHIO VOLUNTEER INFANTRY.

Second Brigade, First Division, First Army Corps.

The May report is signed by Maj. E. M. Semans, who makes the following remarks:

All companies were mustered into service at Camp Bushnell, Columbus, Ohio, May 9, 1898. The regimental hospital was opened May 9. The command left for Camp George H. Thomas May 15, arriving May 16.

CONDENSED SICK REPORT FROM MAY 9-31, INCLUSIVE.

Mean strength.....	887
Admissions from command.....	37
Completed cases.....	27
Returned to duty.....	24
Transferred to other hospitals.....	3
Total.....	27
Remaining on sick report:	
Hospital.....	3
Quarters.....	7
Total.....	10

The June report is signed by Captain Wright, acting surgeon, who makes the following remarks:

The command has been in camp at Chickamauga Park, Camp George H. Thomas, Georgia, during the entire month. The health of the command has been excellent.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	967
Admissions:	
Remaining from last month.....	10
From command.....	26
Total.....	36
Returned to duty.....	22
Transferred to other hospitals.....	8
Total.....	30
Remaining on sick report:	
Hospital.....	0
Quarters.....	8

This regiment left Chickamauga Park, Ga., July 22, and proceeded to Porto Rico. Unfortunately there is no sick report for July.

The August report is signed by Maj. E. M. Semans, with the following remarks:

On August 3, 98 patients landed from the transport *St. Paul*, and were placed in temporary hospital in Arroyo, P. R., by order of Maj. William Stephenson, chief surgeon of the Second Brigade.

On August 5, the regiment moved from Arroyo to Guayama, where a skirmish occurred in which four men were wounded. By order of Major Stephenson a hospital was established in the Spanish barracks at Guayama. On August 8, the regiment was engaged in a skirmish in the mountains, 4 miles north of Guayama. In this skirmish five men were wounded. On August 12, a division hospital was established near Guayama, and the patients from Arroyo and those from Guayama were transferred to this hospital. The prevailing diseases have been remittent malarial fever and acute diarrhea. These have been caused by the climate and by the eating of native fruits.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,215
Admissions from command	143
Completed cases	132
Returned to duty	35
Died	2
Transferred to other hospitals	95
Total	132

There is no report for September, and we have no further record of this regiment. As has been stated this regiment reached Chickamauga Park May 16. On May 17, two cases diagnosed as remittent malaria, both of Company L, reported sick, and these men remained off duty, one for nine and the other for eleven days. On May 20 another case of malaria, also from Company L, reported at "sick call" and remained off duty eleven days. All of these may have been mild cases of typhoid fever. Another suspicious case occurred May 20. This man was a private from Company E. His case also was diagnosed as malaria and he was not returned to duty until twenty days after he reported himself sick. The fourth suspicious case was from Company C. This man reported sick May 22. His case was diagnosed malaria, and he remained sick in quarters until June 12. The fifth case was a private from Company M, who was taken sick May 23, and under the diagnosis of malaria was sent to division hospital May 28, and with the same diagnosis remained sick in hospital throughout the month of June. There can be but little doubt that this was a case of typhoid fever. From this time on cases, for the most part diagnosed as remittent malaria but undoubtedly actually typhoid fever, continued to be reported. The report for June is very incomplete and that for July is, as has been stated, wholly wanting.

The only two points which we have been able to ascertain concerning typhoid fever in this regiment up to the time of its leaving Chickamauga Park, which was July 22, are these:

(1) The regiment reached Chickamauga infected with typhoid fever.

(2) It left Chickamauga badly infected with this disease. Two deaths were reported from this regiment during its stay at Chickamauga, and there were 19 cases of probable typhoid.

During the month of August 111 cases of protracted fever are recorded in the regimental reports. Only 2 of these are recorded as cases of typhoid fever; the others are registered as cases of malaria. It would be interesting if we could know positively how nearly correct the diagnoses in this report are. If they be correct, this regiment practically lost all its typhoid fever between Chickamauga Park and Porto Rico. However, that the regimental diagnosis was not correct is evidenced by the fact that of nine men sent from this regiment while in Porto Rico to Fortress Monroe every one proved to be typhoid fever. How many of the other

cases of malaria reported in August were really cases of typhoid fever we have no means of determining. Neither have we any means of forming an estimate of the probable number of cases of typhoid fever in this command, further than to state that from the imperfect regimental reports and the records of different hospitals we have collected 146 cases. From the fact that all other regiments with more perfect records have furnished a much larger number, we are confident that we have not been able to find half the cases. We infer, from the fact that when this command reached Porto Rico it was necessary to send 98 patients to the hospital immediately, that protracted fevers became very numerous.

SUMMARY.

Assembled at Camp Bushnell, Columbus, Ohio, in April, 1898.
 Mustered into United States service, May 9, 1898.
 Arrived at Chickamauga Park, May 16, 1898.
 Strength on arrival, 887
 Date of first case of probable typhoid fever, May 17, 1898.
 Date of first case of recognized typhoid fever, July 16, 1898.
 Left Chickamauga Park, July 22, 1898.
 Strength on departure, 1,313.
 Number of cases of probable typhoid fever developed at Chickamauga 19

As has been stated, this regiment went to Porto Rico from Chickamauga Park. We have not been able to make any estimate further than that already given of the number of cases developed in this regiment after it left Chickamauga.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Ahern, Patsy	Pvt., K.	1898. July 21	Camp Thomas, Ga.	Typhoid.
Briggs, Forrest C.	Pvt., H.	Nov. 10	Fort Hamilton, N. Y.	Typhoid and immediate exhaustion.
Couts, James H.	Pvt., G.	Sept. 23	Ponce, P. R.	Pulmonary tuberculosis.
Dodge, Daniel H.	Pvt., H.	Aug. 10	Arroya, P. R.	Typhoid and spinal meningitis.
Dent, Joseph W.	Pvt., C.	Sept. 2	Guayama, P. R.	Typhoid.
Dunlap, William C.	Pvt., L.	Sept. 21	.....do.....	Do.
Ferris, William F.	Pvt., K.	Aug. 23	.....do.....	Do.
Ferrin, Guy T.	Pvt., G.	Sept. 13	.....do.....	Do.
Houle, Louis F.	Pvt., C.	Dec. 23	Chesterville, Ohio.	Diphtheria.
Hill, Samuel L.	Pvt., D.	Aug. 12	Guayama, P. R.	Shot on U. S. outpost.
Krewz, Carl	Pvt., C.	Oct. 9	Fort Monroe, Va.	Fecal impaction.
Lawson, Charles E.	Pvt., K.	Aug. 1	Field hospital	Typhoid.
Mitchell, Leon H.	Pvt., L.	Aug. 15	Guayama, P. R.	Do.
Morrison, Henry M.	Pvt., H.	Oct. 26	Hospital ship <i>Miscouri</i>	Do.
Markeson, William P.	Corpl., F	Sept. 15	Guayama, P. R.	Do.
Morgan, Milton M.	Pvt., A.	.....do.....	.....do.....	Do.
Patterson, Elbert L.	Pvt., H.	Oct. 16	.....do.....	Peritonitis and malarial fever.
Reed, William W.	Pvt., K.	Aug. 16	Hospital ship <i>Relief</i> ..	Typhoid.
Randolph, Dayton F.	Pvt., K.	Sept. 4	.....do.....	Do.
Shuster, George	Pvt., G.	Dec. 5	Delaware, Ohio.	Do.
Snyder, John M.	Pvt., F.	(?)	St. Peter's Hospital, Brooklyn, N. Y.	Do.
Sparka, Kurt	Pvt., H.	Oct. 5	Philadelphia, Pa.	Do.
Sims, Irwin E.	Pvt., A.	Aug. 31	Guayama, P. R.	Fever.
Vertner, Avery L.	Pvt., K.	Oct. 31	At sea on board U. S. <i>S. Chester</i>	Exhaustion from dysentery.
Walker, John W.	Pvt., A.	Oct. 9	Guayama, P. R.	Typhoid.
Winter, Wesley Clark.	Pvt., G.	Sept. 5	.....do.....	Do.

Total deaths. 26
 Deaths due to typhoid fever 19

It is impossible to figure out the percentage of deaths among the typhoid cases in this regiment, because we can form no estimate of the number of cases.

COMMUNICATIONS FROM THE SURGEONS OF THE FOURTH OHIO VOLUNTEER INFANTRY.

Medical officers.

Edward M. Seamans, major and surgeon, Delaware, Ohio.
T. B. Wright, captain and assistant surgeon, Circleville, Ohio.
Henry M. Taylor, captain and assistant surgeon, Columbus, Ohio.

Captain Wright makes the following statement:

As we moved from Camp Bushnell May 15, and had no typhoid fever before the middle of June, that camp can be eliminated from the report. We had only two or three cases of typhoid fever while in camp at Chickamauga Park, and in none of these could the source of contagion be definitely traced. We had a batch of cases develop about the same time during transit, between July 26 and August 3, then another apparently distinct lot of cases soon after landing in Porto Rico. After August 15 we had cases coming on all of the time till I left the regiment with the detachment to Vieques, in such a way as to show a steadily operating source of infection. After going to Vieques, I had two or three cases, all of which apparently were infected before leaving Porto Rico. Sanitary conditions at Camp Thomas were always first class in the camp of the Fourth Ohio. Every instruction of the War Department was carried out to the letter. The camp was well drained and was always kept clean; refuse was burned or buried; sinks were kept covered with earth and never allowed to become too full—twice, heavy rains caused them to fill with water, but they were always immediately counterdrained and filled. The men at that time and always were compelled to keep clean, and quarters were uniformly in good order. Blankets were always aired and the cooking of the companies received very careful attention. Inspections were regularly conducted by medical officers at least twice a day, and I feel that every point was carefully guarded from a sanitary standpoint. Upon my return to the regiment July 1 from First Division hospital, I directed that all water used in camp be boiled. This provision was carried out and drinking water was also filtered. I am sure that no point looking to the well-being and health of the men was overlooked, and call attention to the reports of Major Stevenson, brigade surgeon, as to the continuously good condition of this camp of the Fourth Ohio.

I think that the first group of typhoid cases was infected during the practice march July 15, when we were encamped for a few hours on the slope of Snodgrass Hill. Many of the men, in spite of orders to the contrary, filled canteens from a well across the ridge from which it is said a company of the First Ohio Cavalry had derived their water supply, and I have heard that this company had many typhoid cases develop soon after arriving at Tampa. I have, however, not been able to verify this statement. I think, moreover, that the second lot of cases in our regiment developed from infection taken in during the march to the train July 20, when men fell out by the score and drank water from numerous wells along the route, and especially from Cloud Spring, which was a suspected point to us at First Division hospital as early as June 20. The water supply of the Fourth Ohio at Camp Thomas was, up to July 1, almost entirely from the artesian wells, and I never thought this source of water supply was infected. After that time much of the supply came from Chickamauga Creek. This was full of coloring matter and probably of organic matter as well. It was, however, always boiled, so did not prove a source of infection to us. As early as June 15, while at the division hospital, I called attention to the fact that certain regiments were sending comparatively large numbers of typhoid patients and that certain water was probably infected. This report led to an investigation by the brigade surgeons of the First Division, First Army Corps, the result of which was never learned. I am

sure, in spite of the reports of the Government investigation to the contrary, that some sources of water supply at Camp Thomas were infected and that a more prompt investigation at the hands of the War Department would have been the means of at least more quickly limiting the epidemic. Yet, do not understand that I mean this as a reflection upon anyone. I am sure that the difficulties of this campaign were very well met and the handling of the army as a whole, from a health standpoint, was good. I wish to add that all suspected stools were promptly disinfected by us.

After landing with the advanced party at Arroyo I was not with the main camp of the regiment till August 14, but was at the hospital in Guayama. After camp was established at Guayama conditions were not good for two weeks. The camp was not well selected, but was apparently the best available from a military standpoint. The vegetation was very rank, the ground soft, and drainage poor, so that for two weeks things might have been better. By incessant labor, however, the ground was tramped hard, the grass removed, drainage improved, and the camp brought into good condition. Our care was never relaxed and the men worked with intelligence and vigor, so that things were brought into good condition at the earliest practicable moment. The water supply here was from the mountains and was apparently good and presumably free from infection. While I do not think any infection came from direct contact or from flies alighting on the food at Camp Thomas, such a thing might have been possible during this period at the camp at Guayama. It is certain that we carried the infection with us into Porto Rico, but I am not sure that there was not typhoid on the island before we came, as asserted by the native physicians.

At the island of Vieques, where I had a small number of men (about one hundred), sanitary conditions were perfect. We were well housed and had rain water from a freshly cleaned cistern as our sole water supply. Our sink, generally used, was at a good distance from the building, and the one inside used by the few men who were sick was well drained, was flushed each day and kept at all times partly filled with lime. I only wish to say in this connection that it is my opinion that men in the Tropics are better off in houses than in tents, because of the large rainfall. The gain in general health and strength by all the men while on this island was very marked. I wish to say that it seems to me that it would have been better if a less number of men had been brought into camp together than were present at instruction camps, such as Camp Thomas. And I also believe that practice marches, such as were taken by many of the regiments, were not beneficial to the health and vigor of the troops. I am sure that the small death list of the Fourth Ohio was due not only to the constant care exercised, but also to intelligent management by the officers in charge in not overworking men who were being gradually brought into condition for active service.

THIRD ILLINOIS VOLUNTEER INFANTRY.

Second Brigade, First Division, First Army Corps.

The May report for this regiment is signed by Maj. and Surg. John Bliss Shaw, who makes the following remarks:

Headquarters and twelve companies, constituting the Third Illinois Volunteer Infantry, 49 officers and 942 men, were mustered into service at Springfield, Ill., May 7, 1898. The command left Camp Tanner, Springfield, May 14, 1898, arriving at Camp George H. Thomas, Chickamauga Park, Ga., May 17, 1898. The medical officers were: John Bliss Shaw, major and surgeon; A. F. Lemke, captain and assistant surgeon; C. E. Sterrett, lieutenant and assistant surgeon. The hospital stewards were: E. E. Crill, Arthur W. Morse, Ben V. Caffee. The command was vaccinated at Springfield, Ill. The health of the command has not been good. This is due to the effects of vaccination, pneumonia contracted at Springfield, and having no hospital tents. Upon our arrival at Chicka-

mauga we found it necessary to send 10 cases of pneumonia to St. Vincent's Hospital at Chattanooga. We have had 10 cases of measles, which have been isolated. No serious results have followed. The regimental hospital was opened May 13, 1898.

CONDENSED SICK REPORT FOR MAY.

Mean strength	991
Admissions from command	52
Completed cases	49
Returned to duty	12
Transferred to other hospitals	37
Total	49
Remaining on sick report, in hospital	3

The June report is signed by Maj. John B. Shaw, who makes the following statement:

The Third Illinois Volunteer Infantry has been stationed at Camp George H. Thomas, Chickamauga Park, Ga., during the month. The regiment has received 319 recruits to fill companies to full strength. All recruits were immediately vaccinated upon arrival at this camp.

On June 15 S. O. 45 was issued from headquarters of the First Army Corps detailing all hospital stewards and privates to report to headquarters for duty. Hospital Steward Morse and Private York were assigned to regimental duties.

The health of the command has not been good and is attributed to the fact of the extreme heat, to the fact that the food is not properly cooked, to the scarcity of drinking water, and to the absence of bathing facilities. Since June 25 we have enjoyed fine bathing in a bath house erected by the Army and Navy League and provided with every facility for shower baths. The prevailing diseases are pneumonia (contracted at Springfield), typhoid fever, measles, and mumps, which were promptly isolated.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,057
Admissions:	
Remaining from last month	3
From command	51
Otherwise	2
Total	56
Returned to duty	12
Died	1
Transferred to other hospitals	39
Total	52
Remaining on sick report:	
In hospital	3
In quarters	1
Total	4

In the July report Surgeon Shaw states:

The health of the command has not been good. There has been an insufficient supply of drugs; the food supply has not been suitable to the hot climate. The abolition of regimental hospital has had a bad effect on the men, as they did not wish to be separated from their command. It has been impossible to keep correct reports on account of our frequent movements during this month. The principal diseases have been typhoid fever, enteric fever, and malarial fever.

The mean strength for this month is given at 1,323. There are no data of value in this report.

This regiment left Chickamauga Park, Ga., July 22, and proceeded to Porto Rico.

In the August report Major Shaw offers the following remarks:

The regiment is stationed in the field near Guayama, P. R. The health of the command has been fair, considering the fact that the men were not acclimated and that this is the hot and rainy season of the year. I would recommend regularly examined and more competent army cooks to prevent alimentary disturbances that are produced by poorly cooked food. The manner of serving the food should be a matter of investigation. In some instances it is served in such a shape that it is disgusting to the men.

The average strength for August is given at 1,310. It is merely stated that the report contains 146 completed cases.

In the August report Major Shaw makes the following statement:

The health of the command has been poor this month, due in part to poor camp location, poor food, lack of drugs, and rainy weather. The prevailing diseases have been typhoid, tropical typhoid, and malarial fever.

The malarial fever was caused by decomposing matter, emanating from the cane fields in the near vicinity, and by overturning the soil to beautify the company streets in compliance with orders from general headquarters. During the month of September the regiment remained in camp near Guayama.

The mean strength is placed at 1,304.

In the October report Major Shaw remarks:

The regiment remains encamped in the field near Guayama, P. R. The health of the command has been much improved. This has been partly due to change of location of the camp to a higher and better camping place, and to the fact that the men have received their pay, and thus have been enabled to purchase food suitable for them.

The mean strength is placed at 1,315.

The November report is signed by Major Shaw, with the following remarks:

The troops having become partly acclimated enjoyed good health, except a few cases of typhoid fever and malarial fever. We left Porto Rico November 3, 1898, just three months after landing. We embarked on board the transport *Roumania*. This transport was lacking in nothing for comfort of troops, and all officers vied with one another to make our voyage a safe and comfortable one. Each man was provided with a hammock, which proved very beneficial. The sick bay was large, airy, and well lighted. All the men were provided with wire cots and good, clean bedding. These were placed on board before we left Porto Rico. We were also well provided with live poultry and eggs, purchased with the regimental fund. The Red Cross Society gave us soups, all of which were given to the patients. The large, roomy sick bay enabled us to bathe all patients when the temperature rose above 102° F. For this and other reasons our patients were much more comfortable. The following have died during the month:

Private W., of Company G, with typhoid fever, November 2.
 Private J., of Company G, with typhoid fever, November 11.
 Private K., of Company C, with typhoid fever, November 15.
 Private H., of Company H, with appendicitis, November 15.
 Private S., of Company G, with dysentery, November 22.
 Private D., of Company D, with typhoid fever, November 25.
 Private K., of Company A, with inflammation of the bowels, November 25.

On November 11 the regiment was granted a sixty-day furlough.

This regiment arrived at Chickamauga Park, Ga., May 17, with two probable cases of typhoid fever. Both of these belonged to Company C; both were diagnosed enteritis and were sent to St. Vincent's Hospital,

Chattanooga. There is no further record concerning the disposition of these patients. From the time of its arrival, throughout its stay at Chickamauga, cases of enteritis were quite common. Some of these were recognized as typhoid fever after they had been transferred to the division hospital. We will not give a complete list of the recognized and probable cases of typhoid fever in this regiment, but instead we will give a summary of the cases which occurred before and after the regiment left Chickamauga. There were 60 probable cases of typhoid fever in the regiment before July 22, the date when it left Chickamauga Park. Of these 60 cases of probable typhoid fever, 15 were recognized as typhoid either in the regimental or in the hospital report, while 45 show some other diagnosis. The diagnosis most popular, apparently, in this regiment was enteritis. Most of the patients taken sick at Chickamauga were sent to hospital with a diagnosis of enteritis. It will thus be seen that this regiment became quite widely infected with typhoid fever during its stay at Chickamauga; indeed, as we have already stated, there can be little doubt that the regiment reached Chickamauga infected with typhoid, but the infection had become quite widespread at the time of its departure from this place.

When the regiment left Newport News, July 27, it sent 22 cases of undiagnosed fever to the Marine Hospital. All of these proved to be cases of typhoid, and of course all were infected at Chickamauga. From July 27, the date of sailing for Porto Rico, to August 14, there appear on the records 64 cases of prolonged fever; 20 of these are diagnosed typhoid, 24 malaria, 13 diarrhea, and 7 enteritis. It would seem that by August 14, twenty-two days after leaving Chickamauga, all cases infected at Chickamauga should have manifested some symptoms of the disease. We will now endeavor to ascertain whether or not typhoid fever diminished immediately after the period of incubation had been passed since leaving Chickamauga.

From August 15 to 31, inclusive, 89 cases of protracted fever appeared in the regimental sick reports. All of these were sent to hospital or placed on hospital ships and were returned to the United States. We have not been able to obtain the records of the various hospitals to which these patients were sent. We will therefore be compelled to accept the regimental diagnoses. Of the 89 cases of protracted fever originating from August 15 to 31, inclusive, 60 were recognized by the regimental surgeon as typhoid fever. It is true that they were not all diagnosed as typhoid, for some of them are entered under the diagnosis of enteric fever and some are recorded as continued fever. We think it only fair, however, to regard all of these as recognized cases of typhoid fever. There were 18 cases of malaria, 8 of diarrhea, and 3 of enteritis. It will thus be seen that 60 cases of undoubted typhoid fever occurred in this regiment during the latter half of August. We must therefore conclude that the removal

of the camp from Chickamauga and the voyage to Porto Rico did not relieve this regiment of its typhoid-fever infection.

From September 1 to 15, inclusive, there were in the regiment 126 cases of protracted fever. Six of these were recognized as typhoid, 88 are registered as malaria, 29 were diagnosed diarrhea, and 3 are registered under the diagnosis of enteritis. From this record it would appear that from six to eight weeks after the regiment left Chickamauga the number of new typhoid fever cases gradually decreased.

From September 15 to 30, inclusive, there were 95 cases of protracted fever in the regiment. Typhoid fever does not occur in the record. Twenty-one cases are registered as undetermined fevers and 84 cases are diagnosed malaria. It is more than probable that some of the cases designated as undetermined fever were really cases of typhoid. It would certainly be unsafe to conclude from this record that typhoid fever disappeared from the regiment.

From October 1 to 14, inclusive, there are in the regimental records a register of 57 cases of protracted fever. Thirteen of these are recorded as typhoid fever, 39 are designated as malaria, and 5 are diagnosed diarrhea. It will be seen from this that typhoid fever continued in the regiment up to the middle of October, and we will trace it to a later date.

From October 15 to November 4, inclusive, there are 33 cases of protracted fever given in the regimental records. Of these, 13 are recognized as typhoid, 15 as malaria, 2 as diarrhea, and 3 enteritis.

Notwithstanding the apparent break in the existence of typhoid fever during the month of September, we think it is quite certain that typhoid fever continued quite uninterruptedly in this regiment throughout its different encampments and until it returned to the United States and was disbanded.

We may make the following summary concerning the protracted fevers in this regiment:

Protracted fevers at Chickamauga:	
Recognized typhoid fever	15
Otherwise diagnosed	45
Total	60
Protracted fevers at Newport News:	
Recognized typhoid fever	22
Protracted fevers in Porto Rico from July 28 to August 14:	
Recognized typhoid fever	20
Malaria	24
Diarrhea	13
Enteritis	7
Total	64
Protracted fevers in Porto Rico from August 15 to 31, inclusive:	
Recognized typhoid fever	60
Malaria	18
Diarrhea	8
Enteritis	3
Total	89

Protracted fevers in Porto Rico from September 1 to 15:

Typhoid fever.....	6
Malaria.....	88
Diarrhea.....	29
Enteritis.....	3
Total.....	126

Protracted fevers in Porto Rico from September 15 to 30:

Typhoid fever.....	0
Undetermined fever.....	21
Malaria.....	74
Total.....	95

Protracted fevers in Porto Rico from October 1 to 14:

Recognized typhoid fever.....	13
Malaria.....	39
Diarrhea.....	5
Total.....	57

Protracted fevers in Porto Rico from October 15 to November 4, inclusive:

Typhoid fever.....	13
Malaria.....	15
Diarrhea.....	2
Enteritis.....	3
Total.....	33

The number of recognized cases of typhoid fever in this regiment from the time of its enlistment to the time when it was mustered out of service will be shown by the following table:

At Chickamauga.....	15
At Newport News.....	22
In Porto Rico.....	112
Total.....	149

The total number of cases of protracted fevers from the time of its enlistment to the time when it was mustered out of service will be shown by the following table:

At Chickamauga.....	60
At Newport News.....	22
In Porto Rico.....	464
Total.....	546

SUMMARY.

Assembled at Camp Tanner, Springfield, Ill., in April, 1898.	
Mustered into United States service May 7, 1898.	
Arrived at Chickamauga Park May 17, 1898.	
Strength on arrival 991.	
Date of first case of probable typhoid fever May 17, 1898.	
Date of first case of recognized typhoid fever June 28, 1898.	
Left Chickamauga Park July 22, 1898.	
Strength on departure 1,321.	
Number of cases of probable typhoid fever developed at Chickamauga.....	60
Arrived at Newport News July 23, 1898.	
Left Newport News July 27, 1898.	
Number of cases of probable typhoid fever developed at Newport News.....	22
NOTE.—We have not been able to ascertain the date when this regiment reached Porto Rico.	
Number of cases of protracted fever developed during voyage and after reaching Porto Rico:	
From July 28 to August 14.....	64
From August 15 to 31.....	89
During September.....	221
From October 1 to November 4.....	90
Total number of cases of protracted fever reported in this regiment.....	546

These 546 cases were diagnosed as follows:

Typhoid fever.....	149
Undetermined fever.....	21
Malaria.....	303
Diarrhea.....	57
Enteritis.....	16
Total.....	546

The following is an alphabetical list of the total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Allen, Arthur F.....	Pvt., B.	1898. Oct. 28	Guayama, P. R.....	Tropical typhoid fever.
Almond, Charles E.....	Lt., H.	May 27	Chattanooga, Tenn.....	Pneumonia.
Beebe, Edgar D.....	Pvt., G.	May 15	Springfield, Ill.....	Cerebro-spinal meningitis.
Bradish, L. Burton.....	Corpl., A	Oct. 23	Hospital ship <i>Missouri</i>	Typhoid.
Carpenter, Justus A.....	Pvt., E.	Nov. 1	Elgin, Ill., on furlough	Exhaustion, resulting from privation and disease.
Carroll, John H.....	Sgt., M.	Aug. 27	Rochelle, Ill.....	Spinal fever.
Campbell, Irwing R.....	Corpl., C	Aug. 14	Hospital ship <i>Relief</i>	Typhoid.
Callison, Joseph L.....	Pvt., M.	Sept. 18	Guayama, P. R.....	Do.
Cary, Harry V.....	Corpl., L	Sept. 1	do.....	Do.
Church, Charles W.....	Pvt., I.	Oct. 10	Ponce, P. R.....	Do.
Coburn, Clare E.....	Pvt., E.	Sept. 23	Guayama, P. R.....	Do.
Damon, Henry B.....	Pvt., D.	Nov. 25	Chicago, Ill.....	Do.
Daniels, Lester F.....	Pvt., A.	June 8	Chickamauga, Ga.....	Pneumonia.
Dyer, Robert.....	Sgt., I.	June 8	do.....	Acute lobar pneumonia.
Fallon, William.....	Pvt., K.	Dec. 30	Chicago, Ill.....	Typhoid.
Flora, Vincent I.....	Pvt., L.	Aug. 6	Camp Thomas, Ga.....	Do.
Grace, Thomas R.....	Pvt., G.	Oct. 1	Hospital ship <i>Missouri</i>	Do.
Hayes, Charles M.....	Pvt., M.	July 20	Camp Thomas, Ga.....	Typhoid.
Hennis, Christ.....	Pvt., I.	Sept. 22	do.....	Remittent malarial fever.
Holland, Martin.....	Pvt., M.	Sept. 8	Guayama, P. R.....	Typhoid.
Hooley, Jerry F.....	Pvt., M.	Nov. 19	Chicago, Ill.....	Appendicitis.
Huffman, Herman.....	Pvt., K.	Aug. 7	Arroyo, P. R.....	Shot on outpost.
Jensen, Christian.....	Pvt., G.	Nov. 11	Bedloes Island, N. Y.....	Typhoid.
Killefer, Frank F.....	1stsgt., A	Nov. 25	Streator, Ill.....	Inflammation of bowels.
Kraus, William H.....	Pvt., C.	Nov. 15	Mercy Hospital, Chicago, Ill.	Typhoid.
Landman, Emmanuel.....	Corpl., F	Sept. 28	Philadelphia, Pa.....	Do.
Leland, Robert M.....	Pvt., C.	May 16	Springfield, Ill.....	Cerebro-spinal meningitis.
Lindell, Bert J.....	Pvt., H.	June 4	Camp Thomas, Ga.....	Pneumonia.
Lillie, Luman B.....	Corpl., K	Aug. 24	Guayama, P. R.....	Typhoid and malaria.
McCay, Albert P.....	Pvt., C.	Oct. 7	do.....	Malaria, heart failure.
McCune, Brice J.....	Corpl., A	Oct. 3	Newburg, Pa.....	Chronic gastritis and chronic diarrhea.
Matheny, William L.....	Pvt., F.	Sept. 10	Guayama, P. R.....	Typhoid.
Osmanon, Otto C.....	Pvt., C.	July 26	Fort Monroe, Va.....	Typhoid.
Peters, Claude W.....	Pvt., A.	Aug. 23	do.....	Malarial fever.
Potter, Harry T.....	Pvt., H.	Sept. 3	Guayama, P. R.....	Paralysis.
Paxton, James W.....	Pvt., H.	Oct. 30	do.....	Appendicitis.
Shular, Edward C.....	Pvt., C.	June 26	Chickamauga, Ga.....	Typhoid, complicated by meningitis.
Smith, Oscar J.....	Pvt., I.	Aug. 27	do.....	Typhoid.
Stratton, Wm. I.....	Pvt., G.	Nov. 22	Greenwood, Ill.....	Dysentery.
Shaw, Fred.....	Pvt., I.	Aug. 23	Guayama, P. R.....	Typhoid.
Stevens, Oliver L.....	Pvt., G.	Oct. 6	do.....	Remittent malarial fever.
Smith, John A.....	Pvt., C.	Aug. 30	do.....	Typhoid.
Vining, Wilkie L.....	Pvt., L.	Sept. 21	do.....	Do.
Woodward, Edward A.....	Pvt., G.	Nov. 2	Guayama, P. R.....	Do.

Total Deaths.....	44
Deaths due to typhoid fever.....	25
Percentage of deaths among cases of protracted fever (546).....	4.57
Percentage of deaths among recognized cases of typhoid fever (149).....	16.77

It is probable that the cases of Carpenter, Killefer, McCune, and Stratton were in reality typhoid fever.

If these be added to the typhoid cases the percentage would be markedly increased.

COMMUNICATIONS FROM THE SURGEONS OF THE THIRD ILLINOIS VOLUNTEER INFANTRY.

Medical officers.

John Bliss Shaw, major and surgeon, Joliet, Ill.
August F. Lemke, captain and assistant surgeon, Chicago, Ill.
Carlton E. Starrett, lieutenant and assistant surgeon, Elgin, Ill.

Captain and Assistant Surgeon Lemke makes the following statement:

My experience with typhoid fever during the last campaign was limited to one camp, viz, Chickamauga Park. My regiment was stationed at Springfield, Ill., about two weeks prior to our mobilization at the park, and while there we had no typhoid cases. Within a week or two after our arrival at Chickamauga we met with scattered cases. Very soon, however, these increased in number with remarkable rapidity, so that aside from the few scattered milder cases that were left in the regimental hospitals of our division (First Division of the First Army Corps), the division hospital to which I was assigned contained from 50 to 70 cases at all times. Our division hospital was made up of three rows of large hospital tents, and an entire row was set apart for the typhoid cases. We kept careful records of all of our cases and wrote the history of each patient, as is customary in hospitals generally, and made notes each day as we made the rounds. I am very sorry that these records are not at my disposal, so that I might be able to give you more definite and reliable information. Our mortality rate was rather low, I should judge from 4 to 6 per cent, although I do not wish you to take this as anything but a mere estimate.

Aside from the fact that almost all of the male nurses, or rather hospital corps men who had never had any experience, had to be taught to give cold baths and ice packs, and that they were not as ready to attend to the petty wants of the sick, we had no great difficulty in taking care of our patients, and I believe that the death rate was only very slightly, if at all, above that that obtained in our hospitals generally.

If I were to make any criticisms at all of the treatment of the sick in the division hospitals I should say that the nursing force was insufficient and poorly trained.

I notice that you desire information particularly concerning the sanitary condition of the camp. The water supply of the First Division at Chickamauga Park was obtained from various sources, but largely from surface wells, which I believe became contaminated after the arrival of the troops, although this is a mere conjecture. Our corps surgeon was particularly cautious and careful with reference to the care of the sinks, and most of them were looked after daily. The excreta from our typhoid patients were allowed to stand in a strong bichloride solution for from fifteen to twenty minutes, and were then emptied into a sink in which we kept plenty of chloride of lime. Many of the regiments enforced a rule that all water used for drinking purposes should be boiled. A great many of the men objected very strenuously to the taste of this water and kept their canteens filled with unboiled water from various sources, but in each case from some surface well. Without any special effort being made to demonstrate our theories we were inclined to believe that flies had much to do with the dissemination of the bacilli, and as for myself I can scarcely see how it was possible that I was infected, inasmuch as I can not recall a single instance when I drank anything but boiled water, tea, or coffee, and I naturally conclude that the flies that swarmed over everything on our mess table were the means of conveying the infection.

I have several records of necropsies that I made at the division

and the Leiter hospitals, but I am sure that these would be of no service to you. The regimental sick reports I feel must all be quite accurate as regards the relative number of typhoid patients, except, perhaps, in the case of some of the regiments from the Southern States where malaria is prevalent.

I noticed that some of the regimental surgeons from these districts persisted in sending us well-advanced cases of typhoid with rose spots, palpable spleens, etc., with the diagnosis of malarial fever. I could not account for this, except on the supposition that in their private practice these surgeons see very much malarial fever and comparatively little typhoid.

FOURTH PENNSYLVANIA VOLUNTEER INFANTRY.

Second Brigade, First Division, First Army Corps.

This regiment, consisting of eight companies, reached Chickamauga Park, Ga., May 16, 1898. The only sick reports which we have been able to find from this regiment are those for May and June. The mean strength for May is given at 640 and that for June at 639.

In the May report Surg. Morris F. Cawley makes the following statement:

Digestive disorders have prevailed in the regiment throughout the month. These have been due to sudden change from a cold to a warmer climate and from the comforts of civil life to the hardships and exposure of army life.

In the June report the surgeon makes no comments.

This regiment left Chickamauga Park, Ga., July 23, and proceeded to Porto Rico. We have not been able to obtain any regimental reports later than that for the month of June.

The first suspicious case of typhoid fever was a private in Company D, who was sent to hospital with diarrhea June 1 and returned to duty June 11; the second was a private in Company B, who reported sick June 3 and returned to duty June 24. Both of these cases were diagnosed typhoid fever. The statement that the first case was returned to duty June 11 must be erroneous. During its stay at Chickamauga 26 probable cases of typhoid fever were sent to division and other hospitals. The only other records which we have from this command have been obtained from the general hospitals to which patients were sent from Porto Rico. In all, we find records of 66 probable cases of typhoid fever in this regiment. Among the completed cases 6 deaths are reported.

This comprises all the information that we have been able to obtain concerning sickness in this regiment.

SUMMARY.

Assembled at Mount Gretna, Pa., in April, 1898.

Mustered into United States service about May 10, 1898.

Arrived at Chickamauga Park May 16, 1898.

Strength on arrival, 640.

Date of first case of probable typhoid fever, June 1, 1898.

Date of first case of recognized typhoid fever, June 1, 1898.

Left Chickamauga Park July 23, 1898.

Strength on departure, 1,294.

Number of cases of probable typhoid fever developed at Chickamauga 26

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Armstrong, Louis E...	Pvt., E.	1898. Sept. 28	Mahanoy City, Pa....	Remittent malarial fever.
Bloomfield, Charles L.	Pvt., C	Aug. 22	Guayama, P. R.....	Typhoid.
Baker, Arthur.....	Pvt., I.	Sept. 1	.....do.....	Do.
Chesterfield, Wm. F..	Pvt., E.	Aug. 29	Brooklyn, N. Y.....	Dysentery.
Evans, William K....	Corpl., C.	Sept. 16	Columbia, Pa.....	Typhoid.
Elliott, John.....	Pvt., F.	Aug. 14	Guayama, P. R.....	Do.
Farne, Leroy E.....	Pvt., F.	Sept. 3	.....do.....	Do.
Fuhrmann, F. W.....	Pvt., H.	Aug. 3	Arraybo, P. R.....	Do.
Gross, George.....	Pvt., F.	July 30	Fort Monroe, Va.....	Do.
Gangawase Charles W.	Corpl., M	Sept. 22	Ponce, P. R.....	Do.
Hintz, John C.....	Lt., A.	June 27	Camp Thomas, Ga.....	Cerebro-spinal meningitis.
Harpel, George.....	Pvt., H.	Sept. 13	Ponce, P. R.....	Typhoid.
Hanisberger, John E.	Pvt., M.	Sept. 8	.....do.....	Dysentery.
Kimmel, Charles J....	Pvt., G.	Nov. 9	Lincoln, Pa.....	Typhoid.
Krick, Lewis S.....	Pvt., D.	Sept. 17	Allentown, Pa.....	Do.
Keinert, Oscar H.....	Pvt., D.	Aug. 28	Guayama, P. R.....	Do.
Kohler, Edward.....	Pvt., E.	Aug. 28	.....do.....	Typhoid and intestinal hemorrhages.
Miller, Elwood.....	Pvt., A.	Aug. 11	U. S. General Hospital, Fort McPherson, Ga.	Typhoid.
Minnich, Joseph A....	Pvt., G.	Sept. 19	Lykens, Pa.....	Do.
Moore, Charles E.....	Pvt., M.	Sept. 19	Pottstown, Pa.....	Peritonitis.
Michael, Reuben H....	Sgt., H.	Aug. 19	Guayama, P. R.....	Typhoid.
Naftzinger, Frank....	Pvt., E.	Sept. 4	.....do.....	Do.
Smith, Martin H.....	Sgt., K.	Sept. 4	S. S. Chester.....	Malignant malarial fever.
Snyder, Jacob.....	Pvt., A.	Sept. 7	Reading, Pa.....	Typhoid.
Schneider, George W..	Pvt., F.	July 29	Chickamauga, Ga.....	Do.
Schuyler, Charles W..	2d Lt., M.	Oct. 15	Philadelphia, Pa.....	Do.
Schwartz, George H...	Pvt., D.	May 31	.....	Cerebro-spinal meningitis.
Shay, John.....	Pvt., L.	Oct. 16	Fort Monroe, Va.....	Typhoid
Smith, James E.....	Pvt., F.	July 12	.....do.....	Do.
Spindler, Samuel J....	Corpl., F.	Oct. 6	Fort Monroe, Va.....	Do.
Wilkes, William H....	Qmsgt., C	Aug. 18	Guayama, P. R.....	Do.
Weber, Charles H.....	Corpl., M	Oct. 2	Pottsville, Pa.....	Do.
Werner, John M.....	Pvt., M.	Nov. 4	Philadelphia, Pa.....	Do.
Winter, Philip.....	Pvt., A.	June 30	Leiter Hospital, Ga....	Measles.
Wise, Walter E.....	Pvt., I.	Sept. 7	Brooklyn, N. Y.....	Do.

Total deaths..... 35
Deaths due to typhoid fever..... 24

It is impossible to state the percentage of deaths due to typhoid fever in this regiment, because we have no exact knowledge concerning the number of cases. It is likely that the cases in the above list for which no cause of death is given were due to typhoid fever.

COMMUNICATIONS FROM THE SURGEONS OF THE FOURTH PENNSYLVANIA VOLUNTEER INFANTRY.

Medical officers.

Morris F. Cauley, major and surgeon, Allentown, Pa.
George F. Patteiger, lieutenant and assistant surgeon, Hamburg, Pa.

Major Cauley states:

Our camp at Chickamauga was a model; clean, open, with wide streets, plenty of good food, and well policed. Medical supplies were scant and sometimes entirely wanting. More than one-third of the men had constant diarrhea. The soil of our camping ground was of impervious clay, and here and there were holes, some as large as a stovepipe. These were filled up to prevent the horses from breaking their legs, but after very hard rains they were open again. The heavy rains flooded the latrines, and the water, instead of percolating and flowing through the soil, went through these large openings into a lower stratum, carrying the surface drainage and some of the contents of the latrines. Our supply of water was

obtained from wells and springs. The wells were about 30 feet deep. After heavy rains the water from these wells was cloudy; this, I believe, together with the flies, caused the typhoid fever. I ordered the water boiled, but there were no conveniences for this purpose. The men who drank beer from the canteen escaped, because they did not drink contaminated water. I am surprised that our regiment did not have more cases of typhoid fever. There must have been many mild cases that were not reported, but which helped to spread the contagion.

The men observed the rules of cleanliness, were careful of their diet, and, as a rule, led orderly lives. When the July report should have been made, my regiment was on two transports, and when we landed in Porto Rico I was sick with typhoid fever and could not make a report.

SIXTEENTH PENNSYLVANIA VOLUNTEER INFANTRY.

Third Brigade, First Division, First Army Corps.

In the May report, Maj. James Johnson, in charge, makes the following statement:

The general health of the command is good, and with a plentiful supply of water, which is promised, will continue good. Cerebro-spinal meningitis, of which we have had two cases, appeared also in neighboring regiments, some of their cases proving fatal. A general etiological factor of some importance appears to me to be fatigue and exhaustion of energy, and consequent perverted action of nerve centers. The regiment is composed of eight companies and has three medical officers. It was mustered into service at Camp Hastings, Mount Gretna, Pa., May 11, 1898. The command left this place for Camp George H. Thomas, Chickamauga Park, Ga., May 15, arriving May 17.

CONDENSED SICK REPORT FROM MAY 11 TO MAY 31, INCLUSIVE.

Mean strength	628
Diarrhea.....	4
Other diseases	15
Total	19

In the June report, Lieut. H. W. Thayer, in charge, makes the following statement:

A considerable amount of sickness in this regiment during June, causing disability, partial or total, was due to the fact of the men being vaccinated, and several cases of phlegmonous inflammation resulting therefrom. Most of these cases are well or convalescent. No deaths have occurred and there has been but one case of a contagious disease. This was a case of measles, which was promptly isolated, and stringent measures have been taken to prevent the spread of this disease.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	703
Diarrhea	21
Gastritis	1
Catarrhal fever.....	1
Pernicious malaria.....	8
Other diseases.....	35
Total	66

There is no report from this regiment for the month of July.

In the National Guard this was a two-battalion regiment. The Third Battalion was added after the regiment reached Chickamauga. The First and Second battalions went to Porto Rico via Charleston, and the Third went to Newport News, then to Camp Meade, and finally to Porto Rico.

Condensed sick report of Companies B, M, L, and G, constituting the Third Battalion of the Sixteenth Pennsylvania Volunteer Infantry, from August 8 to August 31, 1898, with the Second Army Corps.

Mean strength	510
Typhoid fever.....	20
Chronic diarrhea.....	2
Acute gastritis	1
Intermittent malaria.....	3
Malaria.....	2
Gastro-enteritis	3
Other diseases.....	5
Total	36

In September the Third Battalion left Camp Meade and went to Porto Rico.

Condensed sick report of Companies B, M, L, and G of the Sixteenth Pennsylvania Volunteer Infantry, at Ponce, P. R., for the month of September.

Mean strength	482
Typhoid fever.....	13
Gastro-enteritis	3
Enteritis.....	2
Gastritis.....	4
Malaria.....	23
Diarrhea.....	4
Other diseases.....	6
Total	55

In this report Acting Assistant Surg. Joseph G. Wilson in charge makes the following statement:

I believe that the typhoid fever and malaria from which we have suffered were principally contracted at Chickamauga and Newport News. During the month this detachment has been at Camp Meade, Pa., and at Ponce, P. R. At the former place we had three privy sinks; each man was required to cover his own stool; guards were posted at these sinks to see that this order was obeyed. Each company was provided with a kitchen sink. The drinking water was ordered to be filtered. The dishes were washed in hot water after each mess. Blankets were aired until 11.30 o'clock each morning. Every tent had a board floor. En route from Camp Meade to Ponce there was a great deal of seasickness. I believe that the patients who were transferred to the general hospital at Ponce had their resisting power to disease diminished by the severe seasickness which prevailed and by the irregular times of eating, together with the poor quality of food served on board the transport *Obdum*. Since our arrival at Ponce we have all been drinking water boiled or filtered, and we use the same sanitary precautions that we used while at Camp Meade.

There are no reports from the First and Second battalions after they left Chickamauga. It will thus be seen that our information concerning this regiment is

exceedingly fragmentary. From the various hospital records we have been able to find 118 cases of probable typhoid fever from this regiment. Most of these are left incomplete and still sick in hospital. Among the completed cases 4 deaths are reported.

The only lesson that we are able to learn from this regiment is that the Third Battalion became infected quite seriously with typhoid fever at Chickamauga; it retained this infection at Newport News and at Camp Meade, and carried it to Porto Rico. To our minds this is proof quite positive that change in location is not sufficient to relieve troops infected with typhoid fever of the disease. The infection is carried from camp to camp in the bodies of the soldiers, in their clothes, and on their bedding and tents. After troops become badly infected with typhoid fever the thorough disinfection of all their belongings is necessary in order to stamp out the disease.

SUMMARY.

Assembled at Camp Hastings, Mount Gretna, Pa., in April, 1898.

Mustered into United States service May 11, 1898.

Arrived at Chickamauga Park May 17, 1898.

Strength on arrival, 628.

Date of first case of probable typhoid fever May 8, 1898.

Date of first case of recognized typhoid fever June 20, 1898.

Left Chickamauga Park July 6, 1898.

Strength on departure, 865.

Number of cases of probable typhoid fever developed at Chickamauga..... 17

It is more than probable that this regiment developed typhoid fever at Mount Gretna, Pa. The suspicious cases up to May 17, 1898, are as follows:

No. 1. Company A: Diarrhea, May 8 to June 15.

No. 2. Company H: Diarrhea, May 10 to June 15.

No. 3. Company K: Diarrhea, May 17 to June 2.

Apparently these sick men accompanied the regiment to Chickamauga. The absence of the July report leaves us without information concerning the effect of the removal to Charleston and Newport News upon the number of cases of typhoid fever. However, judging by the histories of other regiments that made the same move and by the subsequent history of the Third Battalion of this regiment, we may be quite certain that the number of cases did not materially decrease. The Third Battalion carried the typhoid infection from Chickamauga to Newport News, then to Camp Meade, and later across the seas to Porto Rico. The history of this battalion alone makes us skeptical of the belief held by some army medical officers that a command widely infected with typhoid fever loses this infection on moving to an uninfected locality. We think that when other facts on these points have been gathered, from a study of this disease it will be conclusively demonstrated that the above-mentioned belief is erroneous.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Barney, John S.....	Pvt., A.	1898. Aug. 15	.....do.....	Exhaustion following typhoid.
Brodhead, W. Meade	Pvt., F.	July 24	Leiter Hospital, Ga...	Typhoid.
Bailey, Edward S.....	Sgt., C.	Oct. 2	Coamo, P. R.....	Do.
Barnes, Charles P.....	Corpl., E.	Sept. 23	Ponce, P. R.....	Gun shot wound.
Bodine, Harry M.....	Pvt., C.	Sept. 13	.....do.....	Typhoid.
Borden, Arthur L.....	Pvt., I.	Oct. 12	.....do.....	Do.
Damon, Clayton E.....	Mus., A.	Sept. 10	Coamo, P. R.....	Do.
Darrow, Arthur E.....	Pvt., A.	Oct. 11	.....do.....	Do.
Dinsmoor, Loten A.....	Sgt., I.	Sept. 22	.....do.....	Do.
Downey, Burton A.....	Pvt., F.	Oct. 14	.....do.....	Do.
Foster, Charles A.....	Pvt., E.	Nov. 22	Franklin, Pa.....	Do.
Grant, Elmer E.....	Pvt., K.	July 13	Hospital.....	Do.
George, William H.....	Pvt., K.	Sept. 9	Coamo, P. R.....	Do.
Hughes, Herman D.....	Pvt., H.	Oct. 4	.....do.....	Do.
Isaacson, Ernest C.....	Pvt., A.	Aug. 3	Ponce, P. R.....	Do.
Koph, Philip.....	Corpl., K.	Aug. 13	Hospital ship Relief..	Exhaustion following typhoid.
Kerns, Erwin M.....	Pvt., C.	Aug. 31	Coamo, P. R.....	Typhoid.
Lubold, Theodore H.....	Pvt., I.	Oct. 2	Cherrygrove, Pa.....	Measles.
McCall, Daniel F.....	Wag., B.	Dec. 29	Newcastle, Pa.....	Typhoid.
Mersheimer, Roy W.....	Pvt., B.	Nov. 10	.....do.....	Diphtheria.
Manning, R. H.....	Pvt., I.	Aug. 25	Ponce, P. R.....	Typhoid.
Mong, George R.....	Pvt., F.	Oct. 11	.....do.....	Do.
McCartney, William P.....	Pvt., I.	Oct. 16	.....do.....	Do.
Olsen, James A.....	Mus., F.	Oct. 5	Coamo, P. R.....	Fever.
Palmer, Charles D.....	Pvt., K.	Nov. 23	Ponce, P. R.....	Typhoid.
Plante, John G. B.....	Pvt., E.	Nov. 4	Jersey City, N. J.....	Do.
Reynolds, Hiram A.....	Pvt., E.	Oct. 13	Coamo, P. R.....	Phthisis.
Ransom, Harry F.....	Corpl., A.	Sept. 30	.....do.....	Typhoid.
Rose, Marcus M.....	Pvt., F.	Aug. 4	Ponce, P. R.....	Do.
Snyder, Albert H.....	Pvt., E.	July 15	Hospital.....	Do.
Sloan, George B.....	Corpl., K.	Sept. 8	Coamo, P. R.....	Do.
Segerstrom, John F.....	Pvt., H.	Aug. 24	Ponce, P. R.....	Do.
Thomas, Melvin M.....	Pvt., I.	July 22	Charleston, S. C.....	Do.
Tweed, Bruce W.....	Pvt., L.	Aug. 23	Fort Monroe, Va.....	Do.
Vincent, Hosea E.....	Pvt., F.	Oct. 10	Coamo, P. R.....	Do.
Wentzel, Isaac E.....	Pvt., M.	Aug. 26	Camp Meade, Pa.....	Do.
Wenzel, Albert L.....	Pvt., F.	July 19	Charleston, S. C.....	Do.
Wilson, Maxwell M.....	Corpl., L.	Nov. 1	Punxsutawney, Pa.....	Do.
Ward, Charles M.....	Pvt., C.	Aug. 17	Hospital ship Relief..	Gangrene of penis.
Wheeling, Jacob A.....	Pvt., E.	Oct. 25	Coamo, P. R.....	Typhoid.
Young, Philander.....	Pvt., K.	Sept. 15	Ponce, P. R.....	Do.

Total deaths..... 41
Deaths due to typhoid fever..... 34

We can not give the percentage of deaths in this regiment, because we have been unable to ascertain the total number of cases.

COMMUNICATIONS FROM THE SURGEONS OF THE SIXTEENTH PENNSYLVANIA VOLUNTEER INFANTRY.

Medical officers.

James Johnston, major and surgeon, Bradford, Pa.
Henry W. Thayer, lieutenant and assistant surgeon, Corry, Pa.
William G. Johnston, lieutenant and assistant surgeon, Titusville, Pa.

Under date of July 17, 1899, Major Johnston furnishes us with the following valuable information:

I was ordered away from my regiment for duty in the ambulance service early in June while at Camp Thomas. Later, I went to Porto Rico with a detachment of the Hospital Corps, which constituted the ambulance company of Gen. James H. Wilson's command, and although my regiment was on the same transport and I was medical officer in charge on board the boat, I did not resume charge of affairs in the regiment, but left the books and reports to my assistant, who continued to be acting surgeon of the regiment throughout the campaign in Porto Rico and until our return to New York. We had no cases of fever at Mount Gretna and very few at Chickamauga. The records of the hospital of the First Division, First Army Corps, at Chickamauga must show that there were scores of cases of typhoid fever from other regiments before there was a case from ours. Our first death in the service was reported in Charleston, and as having occurred in a case that

was left behind and that had not been long in hospital. We had a number of cases of fever while in Charleston. These were left behind in the hospital at that place.

We realized before we left Charleston that we were infected with typhoid fever. There was no typhoid fever in that city at the time of our arrival, and no other explanation that could be offered appeared at all likely in comparison with the explanation that we had brought it with us from Chickamauga. We were in Charleston for more than two weeks. Our men were quartered in cotton warehouses along the water front. The heat was severe, but duty was light. The men ate and drank freely and enjoyed their stay at this place more than that of any other part of the service. They ate freely of fruits as of everything else in the markets. Although they were on travel rations and had already discovered the abominable character of the canned meats, they did not suffer much from that cause at the time, because the regular issue was almost wholly ignored. This was largely due to the extreme generosity of the citizens of Charleston. Every door was open to the soldiers, and those who did not buy their meals at public tables deserted their company mess for private houses, where they were welcomed at the table as guests of the family.

The drinking water was of excellent quality, but a great many also drank more or less freely of whisky and beer. It is worthy of note that a canvass of the companies on their return home after the entire service showed that those who partook of stimulants fared decidedly better than the abstainers. The deaths that occurred were among the teetotalers in a very surprising disproportion.^a

The heat was the one great trouble in Charleston. Temperatures were actually recorded as high as 104 degrees at midnight inside of the brick buildings in which the troops were quartered.

Those who were best behaved were permitted to find cooler quarters, but at the same hour the temperature was 85 degrees at the end of the wharf and the differences in humidity appeared to be so much greater that it amounted to an offset to the lower temperature. As a matter of fact men who did not know what the thermometer registered hardly knew which place to choose.

Our men were not overworked at Charleston, but before leaving they were given two long practice marches. However, except for these two occasions the work performed amounted to almost nothing. The men had abundant opportunity to bathe themselves and wash their clothing. It would be impossible to find men in cleaner condition than ours were during the two weeks' stay in Charleston. They bathed in the slips and along the wharves and at the floating bath house around the point. There were in addition sprinkling hydrants on the docks, at each of which half a dozen men could be showered at once. These shower baths were kept going at full head every evening until taps, when the officers took their turn. There were scores of colored laundresses soliciting washing and mending, and I fully believe that every man in the brigade availed himself on his arrival, and again before leaving took advantage of the last opportunity to leave for the front with a perfectly clean equipment.

When we discovered that the cases that we had sent to Charleston hospitals were typhoid fever, we consulted with the doctors in the city who were in charge of them as to the probable causes and origin of the disease. It was unanimously decided that the disease had been brought with us from Chickamauga, and in what way? Facts seem to us to exclude everything except the interior of the men's bodies as a carrying place of the germ.

The men's clothing was never cleaner. They were not using tents. Their toilet conveniences were far superior to what they had in the field. They were not using one another's forks and spoons. They were not even chewing one another's tobacco, for the reason that all were well equipped and supplied, and two months' service had made each man self-reliant enough or his friends selfish enough so that they did not do these things through

^aThis is not in accord with the views of most surgeons who served in Cuba and Porto Rico.

pure sociability. The Second and Third Wisconsin Regiments were under exactly the same condition as the Sixteenth Pennsylvania. These three regiments were together in Charleston and served in the campaign together in Porto Rico as the First Brigade of the First Division of the First Army Corps under Brigadier-General Ernst. They had similar experiences throughout. The histories of their sick are to be found with ours in the records in the hospital at Ponce, which was first called a transfer hospital under the charge of Doctor Ten Eyck and later made a United States general hospital in charge of Major Birmingham, and in the records of the field hospital of the First Brigade under Acting Asst. Surg. J. W. Wright, of Bridgeport, Conn. The latter was afterwards made a division hospital at Coamo in charge of myself first and afterwards of Maj. J. B. Palmer, of the First Kentucky Volunteer Infantry.

The idea that the typhoid germs were carried along in the intestinal canal from Chickamauga to Porto Rico appeared to me to receive marked confirmation in the peculiarity of its behavior. It is evident to me that the germ showed a long-continued action on a limited portion of the bowel, so that the epidemic as a whole had more of the characteristics of a local than of a general disease. We had a very unusual percentage of ambulatory cases. There was also an unusual percentage of hemorrhages and nearly 50 per cent of deaths resulted from perforation. I have now in my possession notes on the deaths that occurred during my administration of the division hospital at Coamo. Previous to August 26 I was in command of the ambulance company, and after relinquishing charge of this hospital, on account of being ill with fever, I was acting brigade surgeon.

There is no reason to suppose that these notes are not fair illustrations of the type of the disease that existed throughout the brigade.

Case 1. Corpl. John L. Kingston, Company L, Second Wisconsin, admitted August 26. Although wasted in condition this man had been doing full duty and had only returned from outpost on the evening before admission. He was in collapse on admission and died in a few hours. Examination showed a single large perforation, and the peritoneal cavity was filled with bowel contents. The bowel at other points was healthy.

Case 2. Private Erwin M. Kerns, Company C, Sixteenth Pennsylvania. This case was almost exactly identical with the above. This man had been failing in flesh for some time, but had been ill in quarters in his regiment and was not brought to the hospital until perforation had occurred. Both of these men were above the average age for enlisted men, being between 35 and 40 years.

Case 3. G. C. Edwards, quartermaster-sergeant, Third Wisconsin, admitted August 31, 1898. Post-mortem examination showed the liver slightly enlarged, spleen twice its normal size and mesenteric glands enlarged. Peyer's patches enlarged and ulcerated. This was a typical case of typhoid fever.

Case 4. James Wallace, particulars missing.

Case 5. Frank B. Loomis, Company F, Third Wisconsin, age 25 years, died September 8, 1898. Examination showed several perforations and many large ulcers.

Case 6. George B. Sloan, Company K, Sixteenth Pennsylvania, died September 8, 1898, age 25 years. The spleen and mesenteric glands were much enlarged and Peyer's patches were ulcerated.

Case 7. James Turner, Company L, Third Wisconsin, age 21. Examination showed bowels ulcerated and filled to distension with blood.

Case 8. Corpl. Sumner P. Bartlett, Company E, Third Wisconsin, age 29. Post-mortem showed typical typhoid ulceration.

Case 9. Private William H. George, Company K, Sixteenth Pennsylvania. Examination showed liver, spleen, stomach, heart, kidneys, and large intestines normal. Tubercular areas were found in the apices of both lungs, and similar ulcerations were found in the larynx and small intestines.

Case 10. Clayton Damon, Company A, Sixteenth Pennsylvania, age 18 years, died September 11, 1898. Post-mortem examination

showed pin-hole perforation of ileum, Peyer's patches and solitary glands showed ulcers in reparative stages. There was general peritonitis.

Case 11. C. L. McArthur, Company L, Third Wisconsin, died September 11, 1898, age 28 years. Post-mortem showed ulceration of bowels.

Case 12. Edward Wachter, Company H, Third Wisconsin, died September 18, 1898, age 22 years. Post-mortem showed liver, spleen, and mesenteric glands enlarged, and gangrenous ulceration of Peyer's patches.

Case 13. James H. Gamble, Company F, Third Wisconsin, died September 20, 1898, age 32 years. Examination showed mesenteric glands enlarged and Peyer's patches ulcerated.

Case 14. Lester A. Dinsmore, Company I, Sixteenth Pennsylvania, died September 22, 1898, age 28 years. Post-mortem showed kidneys, spleen, and liver normal. There were ulcers in the intestines, some of which had nearly perforated.

Case 15. Harry F. Ransom, Company A, Sixteenth Pennsylvania, died September 30, 1898. Perforations were found in the smaller intestines, and the large intestine was gangrenous.

Case 16. Charles Sunderlin, Company H, Third Wisconsin, died October 2, 1898. Notes missing.

Case 17. Edward S. Bailey, Company C, Sixteenth Pennsylvania, died October 2, 1898. Post-mortem showed liver, spleen, and mesenteric glands enlarged. There was meningitis with effusion.

These are all the cases of which I have records, with the post-mortem reports handed into my office by different surgeons. Leaving cases Nos. 4, 9, and 16 out, we have 14 reports of post-mortem examinations in typhoid fever, 5 of which were distinct cases of perforation. Cases 7, 8, and 14 were of equally local character. This is certainly out of proportion to the experience of the best-known writers on typhoid fever. Those that I have consulted on this point show from 2 to 12 per cent of perforation. Hemorrhage is said by the same authorities to occur in from 3 to 8 per cent of cases. I am sure that our proportion was very much greater than this, but we had no deaths from these causes and consequently I have no records. Our records of symptoms and treatment are scattered and incomplete, for the reason that there was so much else to do that it was impossible to collect these reports in a suitable manner. We were always short of clerical help and stationery. It was my custom, made necessary by circumstances, to give to each medical officer on duty at the hospital a book in which he might make his own daily record for his own use and in his own style. He retained this book in all his changes of assignment and made only the return to the hospital that was required for the monthly reports to the Surgeon-General. During the time that I was in charge of the division hospital at Coamo we had an average daily list of patients amounting to 198, and at one time we reached 338. Our help was almost as fluctuating as our patients, being mostly unwilling details from regiments. We were 25 miles inland from our base of supplies, and had to bring out everything in wagons, so that we were fully occupied with the needs of time and had little opportunity to profit in a professional way by our experience or to put our observations in shape for future use.

When the brigade advanced from Coamo across the island to San Juan we took a part of the division hospital along as a field hospital. On this march the men braced up and there was very little sickness of any kind. The weather was extremely wet, but we reached higher ground and breathed a more salubrious air. We were then ordered home, and turned back and met our third battalion at Ponce.

Before embarking at Ponce all men with a temperature of above 100 degrees were left behind and sent to hospital. When we landed at Jersey City 6 men of our regiment were carried to hospital. One of these subsequently died and I notice that his case is marked typhoid fever. He was taken ill on the 16th of October, one day out from New York, and had been feeling well until that time. He was orderly to the general throughout the campaign and on the boat up to the time when he was taken ill. He had

not endured the hardships nor shared the fare of the men in the ranks, and on the boat his quarters were above deck, and his duties almost nothing. Late at night on October 15 he suddenly fell ill, and had a weak pulse and complained of being dizzy. I saw him at this time and ordered him some aromatic ammonia. The next day in the afternoon he applied for treatment in the hospital, and the surgeon on duty evidently did not recognize typhoid fever, although his temperature was 102.6 degrees. That evening his temperature rose to 104.2 degrees, and the next morning it was 102.2 degrees. I then prescribed quinine and salol. He looked ill and evidently felt ill, but he had none of the signs of typhoid fever, and I confess that I was shocked to learn that he had died, especially in so short a time after he left us. We had about 50 sick in the hospital on the transport on our return from Porto Rico, but I believe that the man above referred to was the only one that died. In this case the difficulty in accounting for typhoid fever is so great that in connection with his unusual symptoms I feel that there should have been post-mortem proof of the existence of the disease. He had been traveling for sixteen days in very comfortable circumstances in the company with older and perfectly healthy men, and while I do not suppose that it is necessary or possible to account for every case, yet I feel that to understand this one would probably give us information of value concerning the nature of typhoid fever.

SECOND WISCONSIN VOLUNTEER INFANTRY.

Third Brigade, First Division, First Army Corps.

This regiment was mustered into service at Camp Harvey, near Milwaukee, Wis., May 12, 1898. It left Camp Harvey May 15, and arrived at Camp George H. Thomas, Chickamauga Park, Ga., May 17. The regiment, at the time of its arrival at Chickamauga Park, had a mean strength of 1,024.

The first sick report covers the period from May 12 to 31, inclusive. There were only six cases recorded in this report; one of these was a case of diarrhea of three days' duration; the other five cases were not intestinal disorders or fevers. However, the June report shows a case of remittent malaria, the initial date of which was May 11.

In the June report First Lieut. Frank C. Moulding, acting surgeon, makes the following statement:

The prevailing disease is malarial fever, either remittent or intermittent, and malarial poisoning, debilitating the men in the extreme. This is due to the fact that the country around Chickamauga Park itself is saturated with malarial germs. The water is insufficient in amount for cooking purposes and washing dishes, and even this insufficient amount of water is abominable, no matter from what source derived. A scum of vegetable matter forms on top of the water while being boiled, and coffee cooked with it has a disgusting smell. The natives were almost unanimous in informing us that any one bathing in Chickamauga Creek for two weeks would surely contract chills and fever; and then this Chickamauga Creek water was conveyed by means of pipes to the camp to wash and bathe in. It is impossible to get a sufficient amount of drinking water of even the poor quality unless the men choose to drink the dirty water from Chickamauga Creek.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1, 176
Typhoid fever.....	1
Malaria.....	12
Not determined	1
Other diseases.....	15
Total	29

The July report is not accompanied by any comments.

CONDENSED SICK REPORT FOR JULY.

Mean strength not given.	
Typhoid fever.....	42
Malaria.....	118
Diarrhea.....	1
Other diseases.....	40
Total	201

This regiment left Chickamauga Park July 6 and went to Charleston, S. C., en route to Porto Rico. The locations occupied during the month of July were at Chickamauga and Charleston.

The regimental sick report for August bears no comments.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength not given.	
Typhoid fever.....	8
Malaria.....	230
Diarrhea.....	68
Intestinal disorders.....	3
Other diseases.....	20
Total	329

There is no report from this regiment after August.

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

- No. 1. Company A: Remittent malaria, May 11 to 27.
- No. 2. Company G: Malarial fever, May 31; still sick June 30.
- No. 3. Company L: Malarial fever, June 7 to 29.
- No. 4. Company H: Malarial fever, June 7 to 18.
- No. 5. Company K: Malarial fever, June 8 to 28.
- No. 6. Company H: Malarial fever, June 12; still sick June 30.
- No. 7. Company H: Malarial fever, June 16; sent to Fort Thomas July 6. Here the disease was diagnosed typhoid fever, and the patient was returned to duty September 2.
- No. 8. Company H: Malarial fever, June 16; still sick June 30.
- No. 9. Company D: Typhoid fever, June 21; died June 28.
- No. 10. Band: Typhoid fever, June 24; disposition not given.
- No. 11. Company H: Typhoid fever, June 24; still sick in Leiter Hospital July 31.
- No. 12. Company H: Typhoid fever, June 25; still sick in Leiter Hospital July 31.
- No. 13. Company G: Malaria, June 26 to July 15.
- No. 14. Company H: Typhoid fever, June 26; disposition not given.
- No. 15. Company G: Malaria, June 28; still sick in Leiter Hospital July 14.
- No. 16. Company H: Typhoid fever, June 30; transferred to Leiter Hospital July 24.
- No. 17. Company K: Malarial fever, July 1; sent to division hospital July 5. Here the diagnosis was changed to typhoid fever, and the patient was returned to duty August 17.
- No. 18. Company D: Malarial fever, July 1; sent to division hospital July 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 15.
- No. 19. Company E: Malarial fever, July 1 to 20.
- No. 20. Company H: Malarial fever, July 1; sent to Fort Thomas July 6. Here the diagnosis was changed to typhoid fever, and the patient was discharged September 26.
- No. 21. Company D: Malarial fever, July 2; sent to Fort Thomas July 5. Here the diagnosis was changed to typhoid fever, and the patient was discharged October 1.
- No. 22. Company I: Malarial fever, July 3; still sick in division hospital July 31.

- No. 23. Company M: Malarial fever, July 3; furloughed July 27.
- No. 24. Company F: Malaria, July 3; sent to Leiter Hospital July 3. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 3.
- No. 25. Company H: Malarial fever, July 3; still sick in division hospital July 31.
- No. 26. Company F: Malarial fever, July 3 to 19.
- No. 27. Company F: Malarial fever, July 3; died July 14.
- No. 28. Company H: Malarial fever, July 4; sent to division hospital July 4. Here the diagnosis was changed to typhoid fever, and the patient was discharged October 14.
- No. 29. Company I: Malarial fever, July 4; still sick in division hospital July 31.
- No. 30. Company H: Malarial fever, July 4; died in Leiter Hospital July 27. In hospital this case was diagnosed typhoid fever.
- No. 31. Company G: Malarial fever, July 5; sent to Leiter Hospital July 5. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 10.
- No. 32. Company H: Malarial fever July 5; sent to Leiter Hospital July 5. Here the diagnosis was changed to typhoid fever, and the patient was furloughed July 18.
- No. 33. Company I: Malaria, July 5; sent to Leiter Hospital July 5. Here the disease was diagnosed typhoid fever, and the patient died July 17.
- No. 34. Company H: Malarial fever, July 5; sent to Fort Thomas July 5. Here the diagnosis was changed to typhoid fever, and the patient was discharged October 28.
- No. 35. Company A: Malaria, July 5; sent to Leiter Hospital July 5. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 18.
- No. 36. Company H: Malarial fever, July 5 to 21.
- No. 37. Company M: Malaria, July 5; sent to Leiter Hospital July 5. Here the diagnosis was changed to typhoid fever, and the patient was furloughed July 27.
- No. 38. Company H: Malaria, July 5; sent to Leiter Hospital July 5. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 20.
- No. 39. Company H: Malaria, July 5; sent to Leiter Hospital July 5. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 16.
- No. 40. Company H: Malaria, July 5; sent to Leiter Hospital July 5. Here the diagnosis was changed to typhoid fever, and the patient was furloughed July 21.
- No. 41. Company D: Malaria, July 5; sent to hospital July 24. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 8.
- No. 42. Company K: Remittent malaria, July 5; furloughed August 18.
- No. 43. Company A: Malaria, July 5; sent to hospital July 24. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 4.
- No. 44. Company D: Typhoid fever, July 6; disposition not given.
- No. 45. Company E: Malarial fever, July 6; sent to Fort Thomas July 6. Here the diagnosis was changed to typhoid fever, and the patient was discharged September 9.
- No. 46. Company not given: Malaria, July 6; sent to Fort Thomas July 6. Here the diagnosis was changed to typhoid fever, and the patient was discharged October 3.
- No. 47. Company H: Malaria, July 6; sent to hospital July 24. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 15.
- No. 48. Company B: Typhoid fever, July 6; furloughed July 9.
- No. 49. Company C: Typhoid fever, July 7; still sick in Leiter Hospital July 31.
- No. 50. Company B: Typhoid fever, July 8; still sick in hospital July 31.
- No. 51. Company G: Malarial fever, July 8; sent to division hospital July 14.
- No. 52. Company H: Malarial fever, July 8; still sick in hospital July 31.
- No. 53. Company K: Typhoid fever, July 8; sent to division hospital July 12.
- No. 54. Company M: Typhoid fever, July 9; furloughed from division hospital August 26.
- No. 55. Hospital Corps: Typhoid fever, July 9; sent to division hospital July 14.
- No. 56. Hospital Corps: Typhoid fever, July 9; disposition not given.
- No. 57. Company H: Malaria, July 9; died July 19.
- No. 58. Company H: Malarial fever, July 10; sent to hospital July 14.
- No. 59. Company I: Malarial fever, July 10; sent to hospital July 14.
- No. 60. Company F: Malarial fever, July 10; sent to hospital July 14.
- No. 61. Company A: Typhoid fever, July 11; sent to Leiter Hospital July 18.
- No. 62. Company H: Malarial fever, July 12; still sick in hospital July 31.
- No. 63. Company I: Typhoid fever, July 12; sent to division hospital July 14.
- No. 64. Company D: Malarial fever, July 13; still sick in hospital July 31.
- No. 65. Company H: Malarial fever, July 13; still sick in hospital July 31.
- No. 66. Company M: Malarial fever, July 13; still sick in hospital July 31.
- No. 67. Company H: Malarial fever, July 14; still sick in hospital July 31.
- No. 68. Company B: Malarial fever, July 14; still sick in hospital July 31.
- No. 69. Company B: Typhoid fever, July 14; still sick in hospital July 31.
- No. 70. Company H: Malarial fever, July 14; still sick in hospital July 31.
- No. 71. Company H: Malarial fever, July 14; still sick in hospital July 31.
- No. 72. Company G: Sent to Leiter Hospital without date or diagnosis July 15. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 17.
- No. 73. Company H: Typhoid fever, July 15; sent to division hospital July 16.
- No. 74. Company G: Malarial fever, July 15; still sick in hospital July 31.
- No. 75. Company D: Malarial fever, July 15; still sick in hospital July 31.
- No. 76. Company K: Malarial fever, July 15; still sick in hospital July 31.
- No. 77. Company K: Malarial fever, July 15; still sick in hospital July 31.
- No. 78. Company G: Malarial fever, July 15; still sick in hospital July 31.
- No. 79. Company F: Malarial fever, July 15; still sick in hospital July 31.
- No. 80. Company H: Malarial fever, July 15; still sick in hospital July 31.
- No. 81. Company G: Sent to Leiter Hospital without diagnosis July 15. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 23.
- No. 82. Company L: Sent to Leiter Hospital without diagnosis July 15. Here the disease was diagnosed typhoid fever, and the patient died August 2.
- No. 83. Company D: Sent to Leiter Hospital without diagnosis July 15. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 10.
- No. 84. Company B: Typhoid fever, July 16; sent to division hospital July 16.

No. 85. Company A: Typhoid fever, July 16; still sick in division hospital July 31.

No. 86. Company A: Typhoid fever, July 16; died July 20.

No. 87. Company D: Typhoid fever, July 16; still sick in hospital July 31.

No. 88. Company D: Malarial fever, July 16; still sick in hospital July 31.

No. 89. Company H: Typhoid fever, July 16; still sick in hospital July 31.

No. 90. Company D: Typhoid fever, July 16; still sick in hospital July 31.

No. 91. Company G: Typhoid fever, July 16; still sick in hospital July 31.

No. 92. Company I: Typhoid fever, July 16; still sick in hospital July 31.

No. 93. Company K: Typhoid fever, July 17; still sick in hospital July 31.

No. 94. Company E: Typhoid fever, July 17; still sick in hospital July 31.

No. 95. Company H: Malaria, July 17; still sick in hospital July 31.

No. 96. Company B: Typhoid fever, July 17; still sick in hospital July 31.

No. 97. Company C: Typhoid fever, July 17; still sick in hospital July 31.

No. 98. Company B: Malarial fever, July 17; still sick in hospital July 31.

No. 99. Company K: Malarial fever, July 18; still sick in hospital July 31.

No. 100. Company E: Typhoid fever, July 18; still sick in hospital July 31.

No. 101. Company A: Typhoid fever, July 18; still sick in hospital July 31.

No. 102. Company E: Malarial fever, July 19; still sick in hospital July 31.

No. 103. Company D: Malarial fever, July 19; still sick in hospital July 31.

No. 104. Company I: Sent to Leiter Hospital without diagnosis July 19. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 10.

No. 105. Company A: Sent to Leiter Hospital July 19 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 19.

No. 106. Company F: Malarial fever, July 20; still sick in hospital July 31.

No. 107. Company D: Malarial fever, July 20; still sick in hospital July 31.

No. 108. Company A: Malarial fever, July 20; still sick in hospital July 31.

No. 109. Company I: Malarial fever, July 20; still sick in hospital July 31.

No. 110. Company D: Malarial fever, July 20; still sick in hospital July 31.

No. 111. Company A: Malarial fever, July 20; still sick in hospital July 31.

No. 112. Company E: Typhoid fever, July 20; still sick in hospital July 31.

No. 113. Company F: Malarial fever, July 20; still sick in hospital July 31.

No. 114. Staff: Typhoid fever, July 20; still sick in hospital July 31.

No. 115. Company M: Malarial fever, July 20; still sick in hospital July 31.

No. 116. Company M: Malarial fever, July 20; still sick in hospital July 31.

No. 117. Company G: Typhoid fever, July 22; still sick in hospital July 31.

No. 118. Company E: Malarial fever, July 22; still sick in hospital July 31.

No. 119. Company I: Malarial fever, July 22; still sick in hospital July 31.

No. 120. Company M: Typhoid fever, July 22; still sick in hospital July 31.

No. 121. Company I: Typhoid fever, July 22; still sick in hospital July 31.

No. 122. Company H: Typhoid fever, July 22; still sick August 31.

No. 123. Company not given: Typhoid fever, July 22; still sick in hospital July 31.

No. 124. Company H: Typhoid fever, July 22; still sick July 31.

No. 125. Company A: Typhoid fever, July 22; still sick in hospital July 31.

No. 126. Company D: Typhoid fever, July 22; still sick in hospital July 31.

No. 127. Company G: Typhoid fever, July 22; still sick in hospital July 31.

No. 128. Company B: Typhoid fever, July 23; still sick in hospital July 31.

No. 129. Company D: Typhoid fever, July 23; still sick in hospital July 31.

No. 130. Company B: Malarial fever, July 23; still sick in hospital July 31.

No. 131. Company F: Malarial fever, July 23; still sick in hospital July 31.

No. 132. Company H: Malarial fever, July 23; still sick in hospital July 31.

No. 133. Company M: Malarial fever, July 23; still sick in hospital July 31.

No. 134. Company A: Typhoid fever, July 23; still sick in hospital July 31.

No. 135. Company H: Malarial fever, July 23; still sick in hospital July 31.

No. 136. Company H: Malarial fever, July 23; still sick in hospital July 31.

No. 137. Company H: Malarial fever, July 23; still sick in hospital July 31.

No. 138. Company D: Malarial fever, July 23; still sick in hospital July 31.

No. 139. Company D: Malarial fever, July 23; still sick in hospital July 31.

No. 140. Company A: Typhoid fever, July 23; still sick in hospital July 31.

No. 141. Company D: Malarial fever, July 24; still sick in hospital July 31.

No. 142. Company F: Malarial fever, July 24; still sick in hospital July 31.

No. 143. Company L: Typhoid fever, July 24; furloughed August 13.

No. 144. Company L: Typhoid fever, July 24; furloughed August 13.

No. 145. Company D: Typhoid fever, July 25; died July 29.

No. 146. Company I: Malarial fever, July 25; still sick July 31.

No. 147. Company D: Malarial fever, July 25; still sick July 31.

No. 148. Company G: Malarial fever, July 25; not returned to duty August 31.

No. 149. Company E: Malarial fever, July 25; not returned to duty August 31.

No. 150. Company A: Malarial fever, July 26; not returned to duty August 31.

No. 151. Company G: Malarial fever, July 27; not returned to duty August 31.

No. 152. Company L: Malaria, July 27; not returned to duty August 31.

No. 153. Company A: Malarial fever, July 27; not returned to duty August 31.

No. 154. Company B: Malarial fever, July 28; not returned to duty August 31.

No. 155. Company I: Malarial fever, July 28; not returned to duty August 31.

No. 156. Company I: Malarial fever, July 28; not returned to duty August 31.

No. 157. Company B: Typhoid fever, July 28; not returned to duty August 31.

No. 158. Company A: Malarial fever, July 28; not returned to duty August 31.

No. 159. Company I: Malarial fever, July 28; not returned to duty August 31.

No. 160. Company D: Malarial fever, July 28; not returned to duty August 31.

No. 161. Company E: Malarial fever, July 28; not returned to duty August 31.

No. 162. Company B: Malarial fever, July 30; not returned to duty August 31.

No. 163. Company B: Malarial fever, July 30; not returned to duty August 31.

No. 164. Company A: Malarial fever, July 31; not returned to duty August 31.

No. 165. Company A: Malarial fever, July 31; not returned to duty August 31.

No. 166. Company C: Malarial fever, July 31; not returned to duty August 31.

No. 167. Company A: Malarial fever, July 31; not returned to duty August 31.

No. 168. Company A: Malarial fever, July 31; not returned to duty August 31.

No. 169. Company H: Malarial fever, July 31; not returned to duty August 31.

No. 170. Company A: Malarial fever, July 31; not returned to duty August 31.

No. 171. Company L: Malarial fever, July 31; not returned to duty August 31.

No. 172. Company C: Malarial fever, July 31; not returned to duty August 31.

No. 173. Company C: Gastric disturbance, August 1 to 24.

No. 174. Company I: Malaria, August 1; still sick in hospital August 31.

No. 175. Company M: Malaria, August 1 to September 20.

No. 176. Company I: Malaria, August 1; still sick in hospital August 31.

No. 177. Company I: Malaria, August 1 to 19.

No. 178. Company I: Malaria, August 1 to 15.

No. 179. Company A: Malaria, August 1; sent to city hospital at Ponce August 1. There is no further record of this case.

No. 180. Company I: Malaria, August 1; still sick in hospital August 31.

No. 181. Company H: Malaria, August 2 to 22.

No. 182. Company D: Malaria, August 2; sick in private house August 31.

No. 183. Company M: Malaria, August 2; sent to hospital at Ponce August 10.

No. 184. Company A: Malaria, August 2; still sick at Ponce August 31.

No. 185. Company D: Malaria, August 2; still sick in hospital August 31.

No. 186. Company G: Malaria, August 2; still sick in hospital August 31.

No. 187. Company C: Typhoid fever, August 2; sent to hospital August 26.

No. 188. Company A: Malaria, August 2; sick in city hospital at Ponce August 31.

No. 189. Company A: Malaria, August 3; still sick in city hospital at Ponce August 31.

No. 190. Company C: Typhoid fever, August 3; left in hospital at Adjuntas.

No. 191. Company D: Malaria and diarrhea, August 3 to 18.

No. 192. Company M: Sent to hospital August 3 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 15.

No. 193. Company B: Malaria, August 4; still sick in hospital August 31.

No. 194. Company B: Malaria, August 4; still sick in hospital August 31.

No. 195. Company C: Malaria, August 5; left in hospital at Adjuntas.

No. 196. Company I: Diarrhea, August 5; sent to hospital August 26.

No. 197. Company C: Malaria, August 5; left in hospital at Adjuntas.

No. 198. Company M: Malaria, August 5; sent to hospital at Ponce August 10.

No. 199. Company A: Malaria, August 6; still sick in hospital August 31.

No. 200. Company C: Typhoid fever, August 6; sent to hospital without date.

No. 201. Company M: Malaria, August 6; still sick in hospital at Ponce August 31.

No. 202. Company A: Malaria, August 6; still sick in hospital August 31.

No. 203. Company A: Sent to hospital without diagnosis August 6. Here the disease was diagnosed typhoid fever and the patient was furloughed September 13.

No. 204. Company E: Sent to hospital without diagnosis August 6. Here the disease was diagnosed enteritis and the patient was furloughed August 16.

No. 205. Company A: Sent to hospital without diagnosis August 6. Here the disease was diagnosed typhoid fever and the patient was furloughed September 28.

No. 206. Company I: Sent to hospital without diagnosis August 6. Here the disease was diagnosed typhoid fever and the patient was furloughed September 19.

No. 207. Company D: Sent to hospital without diagnosis August 6. Here the disease was diagnosed remittent malaria and the patient was furloughed September 27.

No. 208. Company H: Sent to hospital without diagnosis August 6. Here the disease was diagnosed malarial fever and the patient was furloughed August 26.

No. 209. Company B: Sent to hospital without diagnosis August 6. Here the disease was diagnosed enteritis and the patient was furloughed September 3.

No. 210. Company H: Sent to hospital without diagnosis August 6. Here the disease was diagnosed typhoid fever and the patient was furloughed September 9.

No. 211. Company L: Sent to hospital without diagnosis August 6. Here the disease was diagnosed diarrhea and the patient was furloughed September 25.

No. 212. Company I: Sent to hospital without diagnosis August 6. Here the disease was diagnosed remittent malaria and the patient was furloughed October 1.

No. 213. Company C: Sent to hospital without diagnosis August 6. Here the disease was diagnosed enteritis and the patient was furloughed October 1.

No. 214. Company L: Sent to hospital without diagnosis August 6. Here the disease was diagnosed malaria, but the further disposition of the patient is not given.

No. 215. Company A: Typhoid fever, August 7; died August 10.

No. 216. Company D: Malaria, August 7 to 20.

No. 217. Company I: Malaria, August 7; still sick in hospital August 31.

No. 218. Company I: Malaria, August 7; still sick August 31.

- No. 219. Company G: Malaria, August 7 to 31.
- No. 220. Company B: Sent to hospital without diagnosis August 7. Here the disease was diagnosed malarial fever and the patient was furloughed August 27.
- No. 221. Company C: Sent to hospital without diagnosis August 7. Here the disease was diagnosed malarial fever, but the further disposition of the patient is not given.
- No. 222. Company D: Sent to hospital without diagnosis August 7. Here the disease was diagnosed typhoid fever and the patient was furloughed September 19.
- No. 223. Company G: Malaria, August 8; still sick in hospital August 31.
- No. 224. Company A: Malaria, August 8 to 18.
- No. 225. Company B: Sent to hospital without diagnosis August 9. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 25.
- No. 226. Company H: Malaria, August 10; still sick in military hospital at Ponce August 31.
- No. 227. Company E: Malaria, August 10; still sick August 31.
- No. 228. Company F: Malaria, August 10; still sick August 31.
- No. 229. Company H: Malaria, August 10; still sick August 31.
- No. 230. Company A: Malaria, August 10 to 27.
- No. 231. Company B: Malaria, August 10; still sick in hospital August 31.
- No. 232. Company H: Malaria, August 11; still sick August 31.
- No. 233. Company I: Sent to hospital without diagnosis August 11. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 4.
- No. 234. Company E: Malaria, August 12 to 26.
- No. 235. Company A: Malaria, August 12; still sick in hospital August 31.
- No. 236. Company I: Malaria, August 12; still sick in hospital August 31.
- No. 237. Company I: Malaria, August 12; still sick August 31.
- No. 238. Company G: Malaria, August 13; still sick August 31.
- No. 239. Company G: Malaria, August 14; still sick August 31.
- No. 240. Company A: Malaria, August 14; still sick in division hospital August 31.
- No. 241. Company C: Malaria, August 14 to 24.
- No. 242. Company G: Malaria, August 14 to 26.
- No. 243. Company H: Malaria, August 15 to 26.
- No. 244. Company H: Malaria, August 15 to 26.
- No. 245. Company H: Malaria, August 15 to 26.
- No. 246. Company H: Malaria, August 15; still sick August 31.
- No. 247. Company M: Malaria, August 15; still sick August 31.
- No. 248. Company H: Malaria, August 16; still sick August 31.
- No. 249. Company G: Malaria, August 16; still sick August 31.
- No. 250. Company H: Malaria, August 16; sent to hospital at Ponce August 31.
- No. 251. Company A: Malaria, August 17; sent to division hospital August 26.
- No. 252. Company F: Malaria, August 17; still sick in quarters August 31.
- No. 253. Company K: Malaria, August 17; still sick in hospital August 31.
- No. 254. Company B: Typhoid fever August 17; died. Date or place of death not given.
- No. 255. Company K: Malaria, August 17; still sick August 31.
- No. 256. Company A: Malaria, August 17; still sick August 31.
- No. 257. Company H: Malaria, August 17; still sick in quarters August 31.
- No. 258. Company I: Malaria, August 17; still sick in hospital August 31.
- No. 259. Company F: Malaria, August 17; still sick in hospital August 31.
- No. 260. Company I: Malaria, August 17; still sick in hospital August 31.
- No. 261. Company M: Diarrhea, August 18; still sick in hospital August 31.
- No. 262. Company D: Malaria, August 18; still sick in hospital August 31.
- No. 263. Company I: Malaria, August 18; still sick in hospital August 31.
- No. 264. Company M: Diarrhea, August 18; still sick in hospital August 31.
- No. 265. Company G: Malaria, August 18; still sick in hospital August 31.
- No. 266. Company I: Diarrhea, August 18; still sick in hospital August 31.
- No. 267. Company B: Malaria, August 18; still sick in hospital August 31.
- No. 268. Company B: Malaria, August 18; still sick in hospital August 31.
- No. 269. Company I: Malaria, August 18; still sick in hospital August 31.
- No. 270. Company I: Malaria, August 18 to 30.
- No. 271. Company M: Diarrhea, August 18 to 29.
- No. 272. Company I: Malaria, August 18; still sick August 31.
- No. 273. Company I: Malaria, August 18; still sick August 31.
- No. 274. Company K: Sent to hospital without diagnosis August 18. Here the disease was diagnosed malaria and the patient was furloughed October 3.
- No. 275. Company G: Typhoid fever, August 19; sent to division hospital August 24.
- No. 276. Company D: Diarrhea, August 20; still sick in hospital August 31.
- No. 277. Company B: Malaria, August 20; still sick in hospital August 31.
- No. 278. Company F: Malaria, August 21; still sick in hospital August 31.
- No. 279. Company E: Malaria, August 21; still sick in hospital August 31.
- No. 280. Company F: Malaria, August 21; still sick in hospital August 31.
- No. 281. Company G: Malaria, August 21; still sick in hospital August 31.
- No. 282. Company B: Diarrhea, August 23; still sick in field hospital August 31.
- No. 283. Company B: Malaria, August 23; still sick in hospital August 31.
- No. 284. Company B: Malaria, August 23; disposition not given.
- No. 285. Company B: Malaria, August 24; sent to hospital October 5. Here the disease was diagnosed typhoid fever and the patient was still sick November 12.
- No. 286. Company C: Malaria, August 24; still sick September 30.
- No. 287. Company D: Typhoid fever, August 25; sent to hospital at Ponce August 25.
- No. 288. Company M: Malaria, August 26; sent to hospital October 5. Here the diagnosis was changed to typhoid fever, and the patient was still sick November 3.
- No. 289. Company E: Malaria, August 31; sent to hospital October 5. Here the disease was diagnosed typhoid fever, and the patient was still sick November 4.
- No. 290. Company D: Malaria, September 1; sent to hospital October 5. Here the disease was diagnosed typhoid fever, and the patient was still sick October 6.
- No. 291. Company M: Typhoid fever, September 3; died September 3.
- No. 292. Company F: Malaria, September 3; furloughed from hospital October 18.
- No. 293. Company G: Malaria, September 4; sent to hospital October 5. Here the diagnosis was changed to typhoid fever, and the patient was still sick November 3.
- No. 294. Company E: Malaria, September 5; sent to hospital October 5. Here the diagnosis of malaria was continued, and the patient was furloughed November 3.
- No. 295. Company M: Malaria, September 5; sent to hospital September 5. Here the diagnosis was changed to typhoid fever, and the patient was discharged October 24.

No. 296. Company H: Malaria, September 5; sent to hospital September 5. Here the diagnosis was changed to typhoid fever, and the patient was discharged October 18.

No. 297. Company H: Malaria, September 8; sent to hospital September 8. Here the diagnosis was changed to typhoid fever, and the patient was discharged September 12.

No. 298. Company M: Malaria, September 12; furloughed October 11.

No. 299. Company C: Malaria, September 12; sent to hospital November 19. Here the diagnosis was changed to typhoid fever, and the patient was still sick November 19.

No. 300. Company C: Remittent malaria, September 12; furloughed from hospital September 22.

No. 301. Company K: Sent to hospital without diagnosis September 12. Here the disease was diagnosed chronic diarrhea and the patient was furloughed September 22.

No. 302. Company F: Sent to hospital without diagnosis September 12. Here the disease was diagnosed malaria and the patient was furloughed September 27.

No. 303. Company F: Sent to hospital without diagnosis September 12. Here the disease was diagnosed malaria and the patient was furloughed October 1.

No. 304. Company C: Sent to hospital without diagnosis September 12. Here the disease was diagnosed malarial fever and the patient was furloughed September 22.

No. 305. Company C: Sent to hospital without diagnosis September 12. Here the disease was diagnosed typhoid fever and the patient was furloughed September 21.

No. 306. Company C: Sent to hospital without diagnosis September 12. Here the disease was diagnosed diarrhea and the patient was furloughed September 23.

No. 307. Company K: Sent to hospital without diagnosis September 12. Here the disease was diagnosed gastritis and the patient was furloughed September 22.

No. 308. Company M: Sent to hospital without diagnosis September 12. Here the disease was diagnosed malarial fever and the patient was furloughed October 21.

No. 309. Company L: Sent to hospital without diagnosis September 12. Here the disease was diagnosed diarrhea and the patient was furloughed September 22.

No. 310. Company A: Sent to hospital without diagnosis September 12. Here the disease was diagnosed malaria and the patient was furloughed September 24.

No. 311. Company B: Sent to hospital without diagnosis September 12. Here the disease was diagnosed chronic diarrhea and the patient was furloughed October 12.

No. 312. Company C: Sent to hospital without diagnosis September 12. Here the disease was diagnosed malarial fever and the patient was furloughed September 24.

No. 313. Company F: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 14.

No. 314. Company C: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 10.

No. 315. Company G: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 8.

No. 316. Company G: Sent to hospital without diagnosis October 5. Here the disease was diagnosed malaria and the patient was furloughed in October, but the exact date not given.

No. 317. Company H: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 15.

No. 318. Company F: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 12.

No. 319. Company M: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 14.

No. 320. Company A: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 12.

No. 321. Company B: Sent to hospital without diagnosis October 5. Here the disease was diagnosed malarial dysentery and the patient died October 15.

No. 322. Company H: Sent to hospital without diagnosis October 5. Here the disease was diagnosed malaria and the patient was furloughed October 15.

No. 323. Company G: Sent to hospital without diagnosis October 5. Here the disease was diagnosed malarial fever and the patient was furloughed October 15.

No. 324. Company K: Sent to hospital without diagnosis October 5. Here the disease was diagnosed malaria and the patient was furloughed October 15.

No. 325. Company M: Sent to hospital without diagnosis October 5. Here the disease was diagnosed malaria and the patient was furloughed October 15.

No. 326. Company G: Sent to hospital without diagnosis October 5. Here the disease was diagnosed malaria. Further disposition of this patient is not given.

No. 327. Company B: Sent to hospital without diagnosis October 5. Here the disease was diagnosed malarial fever and the patient was transferred to Josiah Simpson Hospital November 19.

No. 328. Company G: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 14.

No. 329. Company L: Sent to hospital without diagnosis October 5. Here the disease was diagnosed typhoid fever and the patient was furloughed October 8.

SUMMARY.

Assembled at Camp Harvey, Milwaukee, Wis., April 28, 1898.

Mustered into United States service, May 12, 1898.

Arrived at Chickamauga, May 17, 1898.

Strength on arrival, 1,204.

Date of first case of probable typhoid fever, May 11, 1898.

Date of first case of recognized typhoid fever, June 16, 1898.

Left Chickamauga Park, July 6, 1898.

Strength on departure, 1,326.

Number of cases of probable typhoid fever developed at Chickamauga 54

Number of cases of protracted fever developed after leaving Chickamauga:

From July 6-31 118

During August 117

During September and October 40

Total number of cases of protracted fever developed in this regiment 329

These 329 cases were diagnosed as follows:

Typhoid fever 113

Malaria 198

Diarrhea 14

Enteritis 4

Total 329

^a By referring to the list of cases it will be seen that patients from this regiment were sent to Leiter Hospital as late as July 19, although the regiment left Chickamauga July 6. These are cases that were in the division hospital when the regiment left Chickamauga and acquired the disease at that place. This figure, therefore, is less than the actual number that developed at Chickamauga, but as there is no regimental record concerning them we have no means of ascertaining the dates of initial sickness.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Allan, Ethan	Corpl., D.	1898, July 29	Transport <i>La Grande Duchesse</i> .	Typhoid.
Anderson, Andrew O.	Pvt., M.	Nov. 29	.....	.....
Baer, Charles O.	Pvt., G.	Aug. 18	Fortress Monroe, Va..	Do.
Barger, Alfred	Pvt., A.	Aug. 5	Charleston, S. C.	Do.
Brand, Robert J.	Mus.	July 5	First Division hospital.	Do.
Bartels, Herman	Corpl., A.	July 20	Charleston, S. C.	Do.
Bills, Edward E.	Pvt., B.	July 1	Hospital ship <i>Relief</i> ..	Appendicitis.
Bronson, Theodore	Pvt., A.	Aug. 10	Buried at Ponce	Exhaustion following typhoid.
Caville, Herbert C.	Pvt., H.	July 19	Charleston, S. C.	Typhoid.
Celney, Theodore	Pvt., F.	June 11	.....	Spinal meningitis.
Clemens, Charles.	Mus., B.	Aug. 16	Ponce, P. R.	Typhoid.
Corbery or Corpery, Timothy.	Pvt., L.	Oct. 9	Returned from Porto Rico with company; furloughed from September 10, 1898, to date of death; died at St. Joseph's Hospital, Ashland, Wis.	Cause not given.
Dahl, Leopold	Pvt., A.	July 28	Charleston, S. C.	Typhoid.
Dillon, Curtin J.	Mus., D.	Oct. 10	Ripon, Wis.	Septic meningitis.
Doege, Albert	Pvt., C.	Oct. 2	.....	Typhoid.
Davis, John L.	Corpl., A.	Aug. 10	Ponce, P. R.	Do.
Engel, Fred	Pvt., H.	Aug. 1	Charleston, S. C.	Do.
Edgerton, George L.	Pvt., K.	Aug. 6	Transport <i>Lampassas</i> .	Do.
Fenstermaehrer, E.	Pvt., B.	July 13	.....	Cholera morbus.
Frier, Wm.	Band, M.	Oct. 24	.....	Typhoid.
Frier, William J.	Pvt., M.	Sept. 2	Ponce, P. R.	Malarial fever.
Gustafson, John C.	Pvt., I.	July 17	Leiter Hospital, Ga.	Typhoid.
Hook, William H.	Pvt., H.	May 15	Milwaukee, Wis.	Bowel trouble.
Heyn, William	Pvt., H.	Aug. 5	Hospital ship <i>Lampassas</i> .	Typhoid.
Johnson, Laurel B.	Pvt., D.	Aug. 26	Charleston, S. C.	Do.
Kandt, Otto	Corpl., F.	July 20	.....	Malarial.
Krousnoble, Jacob	(?) A.	Aug. 12	.....	Typhoid.
Kingston, John F., jr.	Pvt., L.	Aug. 26	Camp Coamo, P. R.	Do.
McCourt, Arthur	Pvt., E.	July 25	Charleston, S. C.	Do.
Miskel, Otto C.	Pvt., G.	Aug. 20	Hospital ship <i>Relief</i> ..	Do.
Olson, Haber	Pvt., B.	Oct. 15	Division Hospital	Do.
Fingel, William H.	Pvt., F.	June 14	Fort Thomas, Ky.	Do.
Schwable, Fred	Pvt., H.	July 27	Leiter Hospital, Ga.	Do.
Shipman, Carl E.	Pvt., B.	July 30	Charleston, S. C.	Do.
Shannon, Oscar L.	Pvt., K.	Aug. 31	Ponce, P. R.	Do.
Schuh, John H.	Pvt., G.	July 29	.....	Do.
Van Breda John.	Pvt., A.	Aug. 1	.....	Do.
Wischell, Frank	Pvt., L.	Aug. 2	Leiter Hospital, Ga.	Do.
Ward, Fred S.	Pvt., D.	June 28	Camp Thomas, Ga.	Fever.
Wright, George C.	Pvt., M.	June 21	.....	Cerebro-spinal meningitis.
Wallace, James.	Pvt., G.	Sept. 2	Coamo, P. R. ....	.....
Total deaths				41
Deaths due to typhoid fever				27
Percentage of deaths among probable cases of typhoid fever (329), 8.20.				
Percentage of deaths among recognized cases of typhoid fever (113), 23.89.				

It is probable that typhoid fever was the cause of death in several additional cases in the above list.

COMMUNICATIONS FROM THE SURGEONS OF THE SECOND WISCONSIN.

Medical officers.

Harry E. Bradley, major and surgeon, Milwaukee, Wis.

Frank C. Moulding, captain and assistant surgeon, Watertown, Wis.

Karl de Sombre, lieutenant and assistant surgeon, Fond du Lac, Wis.

Captain Moulding states:

At Camp Harvey our water supply was obtained from an artesian well and was piped to the camp, so that there was no possibility of its being infected. During the last of April and first of May, while

we were still at Camp Harvey, the weather was very cold, and the men suffered in consequence. The sinks were covered each night and morning in a thorough manner. We had been at Chickamauga Park for about two weeks when an outbreak of typhoid fever occurred. Our regiment was encamped directly over the place where a regiment of regulars had been located previous to our arrival. While in Chickamauga Park we obtained most of our water supply from Crawfish Spring, hauling it a distance of about 5 miles and allowing it to stand in barrels, open for the most part to the germs that might accumulate. A part of our water supply was obtained from an artesian well, about 60 feet deep, near our camp, but the amount obtained here was very small. I endeavored to keep the sinks properly covered, but the nature of the soil was such that this was quite impossible. From Chickamauga we went to Charleston, S. C. There we were encamped in a large cotton warehouse and the sinks were built directly over the salt water. Our water supply was the same as that used in the city and was good.

In Porto Rico we generally obtained drinking water from running streams, and I think it was always good. Typhoid fever followed our regiment throughout the entire campaign and several men died from this disease after they returned home.

Lieutenant de Sombre states:

The regiment was encamped on the fair grounds near Milwaukee for seventeen days. During this time the men had no tents, but were quartered in barns. The sinks were about 30 feet from the barns and the water supply was obtained from an artesian well. The food was wholesome and plentiful. One man died at this place and his death is attributed by Lieutenant de Sombre to over-eating. This must be the case of William Hook, as given in our list of deaths. At Chickamauga the camp site was in the woods, the men were crowded in tents, and it was impossible for them to rest well at night. Food was not good and it was insufficient in amount. Water was obtained from the wells and from Chickamauga Creek. For a while it was brought in barrels from Crawfish Spring. Sinks were just outside of the guard line and were about 4 feet deep. Every time a sink was dug there would be more malarial fever. The principal sickness in this camp was malarial fever. A great many cases reported as typhoid fever I believe to be continued malarial fever. Some surgeons reported typhoid fever if the patient died and malarial fever if he recovered. The regiment was at Chickamauga from May 17 to July 5, during which time sickness constantly increased. From July 7 to 20 the regiment was at Charleston and the men were quartered in cotton sheds which were dry and comfortable. The water was excellent. The sinks were out on the wharves and every discharge fell into the salt water. There was a great deal of sickness at this place after the first week. The sickness is ascribed to exhaustion caused by two forced marches and to the heat. The number of sick increased from 35 to over 200 within four days. At Ponce the regiment encamped on an old sugar plantation. Later the regiment moved to Coamo, while detachments were sent to Adjuntas and Utuado. When the regiment was at Ponce over 100 men were sick. Almost all the illness Doctor de Sombre believed to be due to ptomaine poisoning. Most of the sick had a temperature from 100° to 105° F.

THIRD KENTUCKY VOLUNTEER INFANTRY.

Third Brigade, First Division, First Army Corps.

The May report for this regiment is signed by Maj. Frank Boyd, who makes the following remarks:

The regiment was mustered into service at Camp Collier, Lexington, Ky., May 21, 1898. The medical staff consists of Maj. Frank Boyd, Capt. Austin Bell, and Capt. Nevill M. Garrett.

These men were mustered into the United States service May 10, 1898. Up to this time we have had no hospital and there are no cases of importance calling for special treatment.

This regiment did not reach Chickamauga Park until June 2.

The June report is signed by Capt. and Acting Surg. Austin Bell, who makes the following remarks:

The prevailing diseases for the month were diarrhea, mumps, and measles. Improper cooking and the purchasing of improper articles from hucksters caused the first. A daily rigid inspection of the kitchens, with proper attention to cooking, and prohibiting the sale of undesirable articles, soon checked our diarrhea. We had our contagious cases isolated from the rest of the command, placed guards around them, and kept them there until the infective period had passed. No autopsies have been made.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,213
Admissions from command	63
Completed cases	19

It is to be supposed that all of the completed cases were returned to duty, although this is not specified.

The July report is signed by Capt. and Acting Surg. Austin Bell, who makes the following remarks:

The command has been afflicted with German measles and mumps. We have had a few cases of typhoid fever. Malarial fevers have been quite prevalent. Our isolation methods in the contagious cases were carried out, and most of the cases were sent to the division hospital. No typhoid cases were treated in camp, but were sent to hospital.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,291
Admissions:	
Remaining from last month	44
From command	43
Total	87
Completed cases	47
Returned to duty	47
Died	2
Discharged	10
Transferred to other hospitals	10
Total	69
Remaining on sick report:	
Hospital	27
Quarters	2
Total	29

This regiment left Chickamauga Park, Ga., July 28, and proceeded to Newport News, Va. From the latter place it was transferred to Camp Hamilton, near Lexington, Ky.

The August report is signed by Capt. and Acting Surg. Austin Bell, with the following remarks:

The prevailing diseases for the month of August have been typhoid fever, mumps, and measles. Our typhoid was supposedly

contracted at Chickamauga Park, Ga., probably from a contaminated water supply. All the regiments in the park suffered from this disease to a greater or less extent. The common water supply for the regiments in our brigade was from Crawfish Springs. Each regiment was supplied with a single well. Mumps and measles continued to develop during the month. Rigid daily inspection of the regiment, isolation and guarding of those sick, and detention of suspects greatly reduced the number of new cases.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,079
Admissions:	
Remaining from last month	2
From command	243
Total	245
Completed cases:	
Returned to duty	28
Died	1
Transferred to other hospitals	166
Total	195
Remaining on sick report:	
Hospital	0
Quarters	48

The September report is signed by Capt. and Acting Surg. Austin Bell, with the following remarks:

Mumps and measles have prevailed during the month. All developed cases were isolated under guard, and all suspects were put in detention. All typhoid cases were removed from camp as quickly as possible. Malaria also prevailed during the month. Our privies were kept in the best possible sanitary condition. Copperas (10 pounds to 10 gallons of water) was used in each sink once a day; 3 pounds of powdered copperas was also used. One bottle of chloride of lime to a bucket of water was used to the sinks three times a day. The floors, seats, and walls of sinks have been scoured and mopped once a day with a solution of bichloride of mercury—1 to 200. All tent floors have been cleaned daily with the same solution.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,265
Admissions:	
Remaining from last month	48
From command	90
Total	138
Completed cases:	
Returned to duty	61
Transferred to other hospitals	50
Otherwise disposed of	12
Total	123
Remaining on sick report:	
Hospital	0
Quarters	15

The October report is signed by Capt. and Acting Surg. Austin Bell, with the following remarks:

Malaria has furnished the bulk of cases in October. Rheumatism has furnished more cases than in previous months. Hygienic details in regard to the care of the sick have been carried out. Camp has been kept thoroughly cleaned, and the health of the regiment is greatly improved.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,240
Admissions:	
Remaining from last month.....	15
From command	114
Total	129
Completed cases.....	115
Returned to duty.....	85
Discharged	2
Transferred to other hospitals.....	15
Total	102
Remaining on sick report:	
Hospital.....	1
Quarters.....	23
Total	24

The November report is signed by Maj. Austin Bell, who makes the following remarks:

The command remained at Camp Hamilton from November 1 to 11, when the regiment left for Camp Conrad, near Columbus, Ga. The prevailing diseases have been those that are due to exposure to inclement weather, such as coryza, rheumatism, bronchitis, etc. Venereal diseases, syphilis, chancroid, and gonorrhea have been prevalent. We have recommended that all syphilitics be discharged. We have had no typhoid fever during this month. The cases on this report that are diagnosed typhoid fever are all convalescents. There have been no new cases of any contagious disease other than those mentioned above.

CONDENSED SICK REPORT FOR NOVEMBER.

Mean strength	1,009
Admissions:	
Remaining from last month	24
From command	108
Total	132
Completed cases.....	105
Returned to duty.....	82
Discharged	4
Transferred to other hospitals.....	19
Total	105
Remaining on sick report:	
Hospital.....	3
Quarters.....	24
Total	27

The December report is signed by Major Bell, with the following remarks:

The prevailing diseases have been those that are incident to exposure and damp weather, such as rheumatism, bronchitis, etc. Many cases of influenza have developed during the latter part of the month. The report includes many chronic cases. Discharges have been recommended for most of these. Two cases of measles have developed. These were sent to the brigade hospital, and their clothing has been disinfected. All who have been exposed to these cases had previously had measles.

CONDENSED SICK REPORT FOR DECEMBER.

Mean strength	1,219
Admissions:	
Remaining from last month	27
From command	178
Total	205
Completed cases:	
Returned to duty.....	129
Discharged	2
Transferred to other hospitals	31
Otherwise disposed of	1
Total	163
Remaining on sick report:	
Hospital.....	4
Quarters.....	38
Total	42

The records concerning the sick in this regiment are so imperfect that it has been impossible for us to obtain exact data. As has been stated, the regiment reached Chickamauga Park, Ga., June 2. On June 6 a case diagnosed intermittent malaria is recorded, and this man remained off duty thirteen days. Possibly this may have been a mild case of typhoid fever. On June 12 a case of intermittent malaria was reported. This man remained in quarters until July 18, when he was sent to Leiter Hospital, and here the disease was diagnosed typhoid fever. We must conclude from this that the Third Kentucky Volunteer Infantry reached Chickamauga Park infected with typhoid fever.

During its stay at Chickamauga Park, or up to July 28, this regiment had 38 probable cases of typhoid fever. Only 6 of these were diagnosed typhoid fever in the regiment. Most of these cases were reported as still sick July 31, but whether they were sick in hospital or in quarters is not stated. Among these 38 cases only 1 death is reported; however, 25 of the 38 cases are left incomplete. It appears from the record that one sick man went with the regiment from Chickamauga to Newport News and there died August 1. After death, this case was diagnosed typhoid fever, the initial date of his illness is given as July 26, two days before the regiment left Chickamauga, but he died at Fort Monroe. Adding this case to the others, we have a record of 39 probable cases of typhoid fever at Chickamauga, with 14 completed cases and 2 deaths.

From August 1 to 19, inclusive, 86 cases of protracted fever were sent to hospitals at Fortress Monroe. We have not been able to find in the records of the Josiah Simpson Hospital any account of these cases. Of these 86 cases, 15 were diagnosed typhoid fever before they were sent to the hospital; 13 are recorded as cases of undetermined fever, and the remainder, 58 in number, are registered as cases of remittent malaria. In addi-

tion to those sent to the hospital at Fortress Monroe between August 1 and 19, 12 cases of protracted fever were furloughed from the regiment. Ten of these were recognized as cases of typhoid fever before they were furloughed. Adding these to the 86 sent to the hospital, it will be found that from August 1 to 19 this regiment furnished 98 cases of protracted fever, 25 of which were recognized by the regimental surgeons as typhoid fever, 13 recorded as cases of undetermined fever, and the remainder as cases of remittent malaria.

From August 19 to 31, inclusive, the regimental records show 22 cases which were of sufficient gravity to be sent to a hospital. They were transferred to the division hospital at Lexington. Eleven of these had a regimental diagnosis of typhoid fever, while the others are registered as cases of malaria.

During the month of September, according to the regimental records, 30 cases of protracted fever were sent to the division hospital. Seven of these were recognized as typhoid fever by the regimental surgeons; 1 is recorded as a case of undetermined fever, and the others, 22 in number, are registered as cases of remittent malaria.

The regimental records in October show only 8 cases sent to division hospital; 1 of these was diagnosed typhoid fever, while the others are registered as cases of remittent malaria.

The regimental records for November show only 6 cases sent to hospital; 1 of these is recorded as a suspected case of typhoid fever, while the others are registered as cases of malaria.

The regimental records for December show 16 cases of protracted fever sent to brigade hospital; 6 of these are registered as undetermined fever, while the others are recorded as cases of remittent malaria.

The following summary will indicate as near as we have been able to determine the number of probable cases of typhoid fever in this regiment:

	Cases.
At Chickamauga Park, from June 2 to July 28	39
Sent to hospital at Fortress Monroe or furloughed, from July 28 to August 19	98
From August 19 to 31	22
During the month of September	30
During the month of October	8
During the month of November	6
During the month of December	16
Total	219

It is altogether probable that this number is smaller than that which would indicate the actual facts. Apparently very few men were furloughed from this regiment.

Contrary to the evidence which we have obtained by

the study of several other regiments, it would seem from the imperfect data at our hand concerning the sickness in the Third Kentucky Volunteer Infantry that this command largely, although not completely, lost its typhoid infection after its second move, or when it went from Newport News, Va., to Lexington, Ky.

SUMMARY.

Assembled at Camp Collier, Lexington, Ky., in May, 1898.

Mustered into United States service May 21, 1898.

Arrived at Chickamauga Park June 2, 1898.

Strength on arrival, 1,213.

Date of first case of probable typhoid fever, June 9, 1898.

Date of first case of recognized typhoid fever, June 21, 1898.

Left Chickamauga Park July 28, 1898.

Strength on departure, 1,293.

Number of cases of probable typhoid fever developed at Chickamauga

39

Arrived at Newport News, Va., about July 30, 1898.

Left Newport News August 19, 1898.

Number of cases of probable typhoid fever developed at Newport News

98

Number of cases of probable typhoid fever developed after leaving Newport News:

From August 19 to 31

22

During September

30

During October

8

During November

6

During December

16

Total

219

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Arthur, Clarence A....	Sgt., M.	1898. Sept. 6	Fort Monroe, Va.....	Typhoid and perforation of intestine.
Beller, Kiah J.....	Pvt., I.	Dec. 12	J. Simpson Hospital, Va.	Empyema; pulmonary tuberculosis.
Brewer, Frank	1stsgt., M	Aug. 1	Newport News, Va....	Typhoid.
Chiles, Stratton S.....	Pvt., K.	Aug. 20	Camp Thomas, Ga.....	Do.
Cook, Edward C.....	Pvt., A.	Aug. 15	Fort Monroe, Va.....	Suppurative hepatitis.
Graham, W. H.....	Pvt., A.	1899. Jan. 31	Matanzas.....	Not stated.
Hicks, George N.....	Pvt., H.	1898. Sept. 3	Fort Monroe, Va.....	Typhoid.
James, James.....	Pvt., A.	Oct. 20	Camp Hamilton, Ky..	Do.
Napier, James K.....	Corpl., I.	Sept. 22	do	Do.
Rafferty, George.....	Pvt., C.	Aug. 8	do	Do.
Raines, Orlander J.....	Pvt., I.	Aug. 20	Fort Monroe, Va.....	Do.
Seavers, Albert J.....	Pvt., G.	Sept. 5	Lexington, Ky	Stricture of urethra; septic infection.
Sloan, Till.....	Pvt., G.	Aug. 15	Fort Monroe, Va.....	Carcinoma of rectum.
Smith, George L.....	Corpl., C.	July 23	Camp Thomas, Ga.....	Typhoid.
Sproule, John	Pvt., I.	July 30	Newport News, Va.....	Spinal meningitis.
Stivers, McCreary	Pvt., M.	Aug. 14	do	Typhoid.
Vanhooose, Verner V.....	Pvt., M.	Aug. 9	Camp Thomas, Ga.....	Do.
Total deaths.....				17
Deaths due to typhoid fever.....				11
Percentage of deaths among probable cases of typhoid fever (219), 5.02.				

COMMUNICATIONS FROM THE SURGEONS OF THE THIRD KENTUCKY VOLUNTEER INFANTRY.

Medical officers.

Austin Bell, major and surgeon, Hopkinsville, Ky.

Nevil M. Garrett, captain and assistant surgeon, Frankfort, Ky.

William T. Atkinson, captain and assistant surgeon, Columbus, Ga.

Major Austin Bell states:

Relative to the commencement of the epidemic I desire to state that in my opinion the source of the infection was at Chickamauga Park. I do not think that the regiment was infected on leaving Lexington, for up to June 28 not a single case presented itself with a suspicious fever. Before that date the fever cases were intermittent malaria, typical in type. On June 20 the first suspicious case was seen, followed by another in a very few days. These patients were sent to the First Division Hospital, where subsequently my suspicions were verified by a diagnosis of typhoid fever by the surgeon in charge. From that date to July 4 I did not see any new evidence of the typhoid epidemic, and the fever cases sent to the division hospital were not considered suspicious either by the regimental surgeon or the hospital surgeon. I visited the hospital daily, watching closely for new cases. From July 4 to July 27 I was sick with remittent malaria, as diagnosed by the attending surgeon, in a hospital near Chickamauga, and reported for duty August 2 at Newport News, Va., consequently the cases developing between these dates were known to me only through the regimental records. I saw a fever case carried from Chickamauga to Newport News on the arrival of the regiment at that point, and made the diagnosis of typhoid fever. I was unacquainted with the condition of the case at Chickamauga. While in Virginia our regiment remained in shelter tents for sixteen days without any shade to protect the men from the scorching sun. Much sickness developed, and in most instances the onset was sudden, and an initial chill was very common, followed by a temperature of 104° to 105° F. Often on first seeing the patient an excessively high temperature would be found, with the history of feeling perfectly well until that day. Many of these cases of sudden incipency subsequently proved to be typhoid. Only those cases were diagnosed malaria or typhoid which were undoubtedly these diseases. The undetermined class consisted mostly of suspected typhoid cases. I think many presented a mixed infection, for a preliminary cathartic followed by quinine would occasionally result in a normal or nearly normal temperature, without a subsequent typhoid rise. It appeared that in many instances the typhoids were masked by mild heat prostrations, and a typical typhoid course would follow recovery from that condition. Whatever the cause, certainly the incipency of typhoid fever caused at this point was very atypical. Usually the patients were sent to the Fortress Monroe General Hospital before a certain diagnosis could be determined.

On returning to Lexington, Ky., the number of typhoids became less, and in a short time the epidemic was entirely under control and but an occasional case appeared. An absolutely fresh camp site, purification of all drinking water by filtering and boiling, the removal from camp of all suspicious cases of illness, and a well-constructed closet with an abundance of disinfectants were responsible, I believe, for this change.

For the months of September, October, November, and December the diagnoses made by the regimental surgeon seemed to be disregarded in your report and all cases of continued fever are classed as typhoidal in nature. This is taking much for granted. Until November we were not in a regimental hospital, and our instructions were that all cases requiring special diet or unsuited for treatment in quarters should be sent to division hospital. Acting on these instructions, many cases not of a serious nature were sent to the hospital.

If we treated typical cases of intermittent malaria in camp, why is it not probable that the remittent form would present itself in

the hospital? Furthermore, instructions were given that patients should be returned to the regiment only when capable of performing every duty, and the regimental surgeon was required to visit the hospital daily, in order to see the patients about to be returned. As a result of this, mild cases were often kept in hospital for a long time. During the months of November and December our sickness was nearly all of a mild nature, and I believe the regimental records show the cases as they existed. Those instances in which the diagnoses were not made were sent to the hospital before the attack was developed. The hospital records should give data for these. As a partial excuse for the condition of the regimental records, I wish to state that on reaching Chickamauga Park a surgeon, one assistant surgeon, and two hospital stewards were taken from the regiment, leaving all the work on a green steward and myself. It was impossible for me to look after the camp hygiene, attend to the sick of the regiment, and keep an accurate sick record. The report for the month of July was not made by me. In Lexington, Ky., the medical staff was again reduced and all the work left on me; consequently there are many inaccuracies which would not have existed had a sufficient number of medical officers served continuously with the regiment.

GENERAL REMARKS CONCERNING TYPHOID FEVER IN THE FIRST DIVISION OF THE FIRST ARMY CORPS.

It is quite certain that most if not all of the regiments of this division reached Chickamauga with one or more men infected with typhoid fever. The number of cases of probable typhoid fever developed in this division, with a mean strength of 11,339 officers and men, at Chickamauga Park, may be tabulated as follows:

Brigade and regiment.	Arrived.	Left.	Number of cases.
<i>First Brigade.</i>			
First Kentucky	June 11	July 26	22
Third Wisconsin	May 15	July 5	49
Fifth Illinois	May 17	Aug. 3	47
<i>Second Brigade.</i>			
Fourth Ohio	May 16	July 22	19
Third Illinois	May 17	July 22	60
Fourth Pennsylvania	May 16	July 23	26
<i>Third Brigade.</i>			
Sixteenth Pennsylvania	May 17	July 6	17
Second Wisconsin	May 17	July 6	54
Third Kentucky	June 2	July 28	39

It may possibly be of interest to endeavor to ascertain whether or not the rapidity with which typhoid fever spread among the different regiments was in direct proportion to the number of infected men in the regiment when it reached Chickamauga. We do not suppose that this question can be answered conclusively and positively, but the inquiry may be of some interest. We will compare the Third Illinois with the other regiments of the same brigade. Practically all the regiments of this brigade came to the park and left at the same time. During the fourteen days that remained of May, after the arrival of the Third Illinois, this regiment developed 9 cases of probable typhoid fever. We will suppose that all of these were infected before the regiment reached Chickamauga. Then we may say that this regiment had within itself 9 foci for the distribution of the disease, and from these foci there were developed, up to July 22, 60 cases of probable typhoid

fever. During the fifteen days that remained of the month of May after the arrival of the Fourth Ohio there developed in this regiment 6 cases of probable typhoid fever, and from these 6 foci there developed, up to July 22, 19 cases of probable typhoid fever. During the fifteen days that remained of the month of May after the arrival of the Fourth Pennsylvania there were no cases of typhoid fever in this regiment, and 26 cases developed by July 23. We have carried out this line of inquiry in several brigades, and have reached the general conclusion suggested by the above-given figures, i. e., there is no constant relation between the number of men infected with typhoid fever in a regiment at the time of its going into a camp and the number that developed the disease outside of those previously infected within a given time. The explanation for this is not difficult to find. The means for the spread of the infection must vary in every command.

There is one point in connection with the camp of the Second Brigade of the First Division at Chickamauga which may be worthy of consideration. From April 22 to 30, 1898, the Sixteenth United States Infantry was encamped in Chickamauga Park. At this encampment at this place this regiment reported no sickness, but soon after it reached Tampa in May, 1898, it reported 13 cases of acute intestinal catarrh, 3 cases of diarrhea, and 3 cases of typhoid fever. When the Second Brigade of the First Division of the First Army Corps was located in Chickamauga Park, the regimental camp of the Third Illinois occupied a part of the site recently vacated by the Sixteenth United States Infantry, while the other regiments of this brigade were placed some distance away. It is possible that the Sixteenth United States Infantry might have infected the ground subsequently occupied by the Third Illinois. As an isolated instance this fact can have no great sig-

nificance, but we have found numerous similar instances, and we are strongly of the opinion that only in case of the most urgent military necessity should any command be placed on a site recently vacated by another.

It must be evident from the histories of the regiments of this division that military organizations after becoming widely infected with typhoid fever do not lose this infection on changing locality of camp, even when all the sick are left behind and the site to which the command removes is free from infection. The infection is carried in the bodies of the men, in their clothing, bedding, and tentage. Thorough disinfection of everything, in addition to change of location, is necessary in order to stamp out typhoid fever after it has become widely distributed in a command.

We have not been able to obtain the records of the hospital of this division.

Summary of deaths in the First Division of the First Army Corps.

Brigade and regiment.	Total deaths.	Deaths due to typhoid fever.
<i>First Brigade.</i>		
First Kentucky.....	28	18
Third Wisconsin.....	36	15
Fifth Illinois.....	16	8
Total.....	80	51
<i>Second Brigade.</i>		
Fourth Ohio.....	26	19
Third Illinois.....	41	25
Fourth Pennsylvania.....	35	24
Total.....	105	68
<i>Third Brigade.</i>		
Sixteenth Pennsylvania.....	41	34
Second Wisconsin.....	41	27
Third Kentucky.....	17	11
Total.....	99	72
Total deaths.....	284	
Deaths due to typhoid fever.....	191	
Percentage of deaths from typhoid to total deaths.....	67.25	

CHAPTER II.

TYPHOID FEVER IN THE SECOND DIVISION OF THE FIRST ARMY CORPS.

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THIRTY-FIRST MICHIGAN VOLUNTEER INFANTRY.

First Brigade, Second Division, First Army Corps.

This regiment assembled at Island Lake, Mich., in the latter part of April, 1898. It reached Chickamauga Park, Ga., May 17, 1898. The first report covers the dates from May 17 to 31, inclusive.

In this report, Maj. Andrew Biddle, in charge, makes the following statement:

There have been, and still are, many cases of congestive diarrhea, due to the combined influence of change of troops from Michigan to this climate, extreme heat—possibly injudicious feeding; all drinking water has been boiled. Otherwise the command has been in good health, standing the campaign well. No contagious disease exists. The policing of the camp is excellent.

CONDENSED SICK REPORT FROM MAY 17 TO 31, INCLUSIVE.

Mean strength	1,019
Diarrhea	4
Intestinal toxæmia	1
Malaria	1
Other diseases	18
Total	24

It is evident, from the remarks of Major Biddle, that all cases of diarrhea have not been recorded in the sick report.

In the June report, Capt. Frank K. Owens, in charge, makes the following statement:

There have been, and still are, many cases of congestive diarrhea, due to climatic changes, change of water, and at present partly due to the large amount of food shipped to the soldiers from Michigan; otherwise the command has been in excellent health, standing the campaign well. During the month the entire regiment was vaccinated, about 70 per cent of the vaccinations

being satisfactory; no serious illness has resulted from this operation. No contagious disease exists.

The policing and general sanitary condition of the camp are excellent.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,315
Diarrhea	17
Remittent fever	1
Enteritis	1
Typhoid fever	1
Other diseases	36
Total	56

The recognized typhoid-fever case was that of a private in Company C, and the initial date is given as June 1. It will thus be seen that this case of typhoid fever appeared within the period of incubation after leaving Island Lake. It is therefore probable that this regiment went to Chickamauga infected with typhoid fever. All cases of diarrhea in this report were of short duration. The case of remittent fever continued for only three days.

The sick report for the month of July is signed by Captain Owens without comment.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,303
Diarrhea	14
Remittent malaria	13
Intermittent malaria	16
Typhoid fever	10
Enteritis	1
Other diseases	53
Total	107

Of the recognized cases of typhoid fever, 1 was brought over from the June report, leaving 9 cases developed in the month of July. Of the 10 cases of typhoid fever up to the close of this report, 2 died during July. There was 1 other death in the regiment during the month of July. This was a private in Company F, whose name first appears on sick report June 26. His disease was diagnosed as acute indigestion, and he died July 17. Undoubtedly this also was a case of typhoid fever. There are many other probable cases of typhoid fever in this report. These cases will be given in the list appended later.

This regiment left Chickamauga for Knoxville, Tenn., August 21.

The August report is signed by Captain Owens without comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength.....	1, 167
Intermittent malaria.....	15
Remittent malaria.....	22
Malaria.....	25
Diarrhea.....	20
Typhoid fever.....	18
Indigestion.....	8
Enteritis.....	2
Undetermined fever.....	1
Dysentery.....	1
Other diseases.....	21
Total.....	133

Of the 18 cases of typhoid fever registered in this report, 11 developed in the month of August.

The September report is signed by Captain Owens without comment.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength.....	1, 068
Malaria.....	63
Intermittent malaria.....	9
Remittent malaria.....	37
Diarrhea.....	6
Typhoid fever.....	30
Gastritis.....	1
Enteritis.....	2
Other diseases.....	25
Total.....	173

The October report is signed by Captain Owens without comment.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength.....	931
Malaria.....	66
Remittent malaria.....	28
Intermittent malaria.....	6
Diarrhea.....	4
Typhoid fever.....	44
Dysentery.....	1
Enteritis.....	2
Other diseases.....	33
Total.....	184

Of the 44 cases of recognized typhoid fever in this report, 24 originated in October.

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

A.—At Chickamauga.

- No. 1. Company C: Typhoid fever, June 1 to July 27.
- No. 2. Company F: Indigestion, June 26; died July 17.
- No. 3. Company E: Malaria, June 31 to July 28.
- No. 4. Company A: Malaria, July 6 to 26.
- No. 5. Company G: Malaria, July 6; furloughed September 18.
- No. 6. Company F: Malaria, July 8 to 26.
- No. 7. Company F: Malaria, July 9; still sick August 20. There is no further record of this case.
- No. 8. Company M: Typhoid fever, July 11; died July 13.
- No. 9. Company M: Malaria, July 11 to 23.
- No. 10. Company F: Typhoid fever, July 11; sent to Leiter Hospital July 14.
- No. 11. Company L: Malaria, July 11; sent to division hospital July 22.
- No. 12. Company L: Malaria, July 13 to August 2.
- No. 13. Company K: Malaria, July 14 to August 30.
- No. 14. Company C: Malaria, July 14 to September 17.
- No. 15. Company G: Malaria, July 14; sent to division hospital July 31.
- No. 16. Company C: Typhoid fever, July 14; furloughed August 16. In the division hospital this case was diagnosed as continued fever.
- No. 17. Company A: Malaria, July 14 to August 29.
- No. 18. Staff: Typhoid fever, July 15 to August 29.
- No. 19. Company H: Malaria, July 16 to November 26.
- No. 20. Company F: Malaria, July 16 to August 19.
- No. 21. Company F: Malaria, July 16; furloughed August 31.
- No. 22. Company D: Malaria, July 17; sent to hospital August 24.
- No. 23. Company D: Malaria, July 17 to August 27.
- No. 24. Company I: Malaria, July 17; furloughed November 20. At the division hospital this case was diagnosed typhoid fever.
- No. 25. Company D: Malaria, July 17; still sick August 31. There is no further record of this man.
- No. 26. Company I: Malaria, July 18 to August 12.
- No. 27. Company E: Malaria, July 18; sent to division hospital August 24.
- No. 28. Company E: Malaria, July 18 to August 6.
- No. 29. Company F: Malaria, July 19; sent to Fort Myer November 24. At the division hospital this case was diagnosed as typhoid fever.
- No. 30. Company I: Malaria, July 19 to August 10.
- No. 31. Company M: Malaria, July 20; furloughed August 31.
- No. 32. Company L: Malaria, July 20 to August 21.
- No. 33. Company I: Malaria, July 21 to August 6.
- No. 34. Company A: Malaria, July 21; furloughed September 14.
- No. 35. Company G: Malaria, July 23 to August 22.
- No. 36. Company H: Malaria, July 24; sent to division hospital August 31.
- No. 37. Company L: Typhoid fever, July 27 to October 19.
- No. 38. Company H: Malaria, July 27 to August 11.
- No. 39. Company B: Malaria, July 27; sent to division hospital August 31.
- No. 40. Company A: Typhoid fever, July 27; disposition not given.
- No. 41. Company D: Typhoid fever, July 27; died July 28.
- No. 42. Company G: Malaria, July 27; furloughed September 14.
- No. 43. Company G: Typhoid fever, July 28; furloughed August 18.
- No. 44. Company G: Malaria, July 28 to August 17.
- No. 45. Company I: Typhoid fever, July 28; disposition not given.

- No. 46. Company G: Malaria, July 29 to September 30.
 No. 47. Company D: Malaria, July 29 to October 21.
 No. 48. Company K: Typhoid fever, July 30; furloughed September 14.
 No. 49. Company C: Malaria, July 31; furloughed August 8.
 No. 50. Company C: Malaria, July 31 to August 18.
 No. 51. Company G: Malaria, July 31; sent to division hospital August 31.
 No. 52. Company C: Typhoid fever, August 1; furloughed September 14.
 No. 53. Company C: Malaria, August 1 to 27.
 No. 54. Company D: Typhoid fever, August 2 to October 19.
 No. 55. Company K: Malaria, August 3; furloughed September 14.
 No. 56. Company D: Malaria, August 3; furloughed August 24.
 No. 57. Company B: Malaria, August 3; furloughed August 19.
 No. 58. Company G: Malaria, August 4 to September 4.
 No. 59. Company M: Malaria, August 5 to October 19.
 No. 60. Company A: Malaria, August 5; sent to division hospital August 14. There is no further record of this case.
 No. 61. Company G: Malaria, August 5; furloughed August 31.
 No. 62. Company G: Typhoid fever, August 6; furloughed September 14.
 No. 63. Company I: Malaria, August 6 to September 1.
 No. 64. Company D: Malaria, August 7; furloughed August 19.
 No. 65. Company D: Malaria, August 7 to 29.
 No. 66. Company F: Malaria, August 8; sent to division hospital August 31.
 No. 67. Company M: Typhoid fever, August 8; sent to division hospital August 31.
 No. 68. Company M: Typhoid fever, August 8 to October 14.
 No. 69. Company B: Malaria, August 8 to October 5.
 No. 70. Company F: Malaria, August 9; furloughed September 14.
 No. 71. Company B: Malaria, August 9 to September 10.
 No. 72. Company M: Malaria, August 10 to October 2.
 No. 73. Company H: Malaria, August 11; sent to division hospital September 1.
 No. 74. Company A: Malaria, August 12; furloughed November 10.
 No. 75. Company M: Malaria, August 12; furloughed September 14.
 No. 76. Company K: Malaria, August 13 to September 13.
 No. 77. Company A: Malaria, August 13 to September 14.
 No. 78. Company H: Malaria, August 13; sent to division hospital August 31.
 No. 79. Company K: Malaria, August 14; furloughed August 25.
 No. 80. Company B: Malaria, August 14 to 31.
 No. 81. Company L: Malaria, August 15; furloughed September 14. At the division hospital this case was diagnosed typhoid fever.
 No. 82. Company E: Typhoid fever, August 15; furloughed September 14.
 No. 83. Company A: Malaria, August 15; sent to division hospital August 31.
 No. 84. Company B: Malaria, August 15 to October 14.
 No. 85. Company L: Malaria, August 15 to September 1.
 No. 86. Company L: Malaria, August 16; sent to division hospital August 31.
 No. 87. Company H: Malaria, August 16 to September 1.
 No. 88. Company H: Typhoid fever, August 16; furloughed September 10.
 No. 89. Company E: Malaria, August 17 to October 27.
 No. 90. Company E: Malaria, August 17 to September 5.
 No. 91. Company A: Malaria, August 18 to September 5.
 No. 92. Company D: Malaria, August 19 to October 6.
 No. 93. Company C: Malaria, August 19 to October 6.
 No. 94. Company A: Malaria, August 19; sent to division hospital August 31.
 No. 95. Company G: Malaria, August 19; furloughed September 14.

B.—At Knoxville.

- No. 96. Company D: Typhoid fever, August 22 to October 21.
 No. 97. Company A: Malaria, August 22 to October 10.
 No. 98. Company I: Malaria, August 22; furloughed September 14.
 No. 99. Company B: Malaria, August 22; furloughed September 14.
 No. 100. Company E: Malaria, August 23; furloughed September 14.
 No. 101. Company M: Malaria, August 23 to October 24.
 No. 102. Company E: Typhoid fever, August 24; furloughed September 14.
 No. 103. Company A: Malaria, August 24; furloughed September 14.
 No. 104. Company D: Malaria, August 24; furloughed September 14.
 No. 105. Company B: Malaria, August 25 to September 17.
 No. 106. Company C: Malaria, August 25; furloughed September 14.
 No. 107. Company C: Malaria, August 25 to September 15.
 No. 108. Company C: Malaria, August 26; furloughed September 14, and this furlough was extended.
 No. 109. Company E: Malaria, August 27; furloughed September 14, and this furlough was extended.
 No. 110. Staff: Typhoid fever, August 27; died September 9.
 No. 111. Company H: Malaria, August 28; furloughed September 14, and this furlough was extended.
 No. 112. Company L: Typhoid fever, August 28; furloughed September 14, and this furlough was extended.
 No. 113. Company H: Malaria, August 18; furloughed September 14, and this furlough was extended. In the division hospital this case was diagnosed as typhoid fever.
 No. 114. Band: Typhoid fever, August 28; furloughed September 14, and this furlough was extended.
 No. 115. Company D: Malaria, August 29; furloughed September 14, and this furlough was extended.
 No. 116. Company L: Malaria, August 29; furloughed September 14, and this furlough was extended. In the division hospital this case was diagnosed as typhoid fever.
 No. 117. Company K: Malaria, August 30; furloughed September 14.
 No. 118. Company F: Typhoid fever, August 30; furloughed September 14.
 No. 119. Company K: Malaria, August 31; furloughed September 14. This man returned to his regiment convalescent from typhoid fever and was again furloughed.
 No. 120. Company H: Malaria, August 31; still sick September 30.
 No. 121. Company K: Malaria, August 31; furloughed September 14.
 No. 122. Company E: Malaria, September 1; furloughed September 14, and this furlough was extended. At his home this case was diagnosed typhoid fever.
 No. 123. Company I: Malaria, September 3; furloughed September 14, and this furlough was extended.
 No. 124. Company M: Malaria, September 3 to October 14.
 No. 125. Company B: Malaria, September 3; died September 9.
 No. 126. Company F: Malaria, September 4; furloughed September 14, and this furlough was extended.
 No. 127. Company D: Malaria, September 5; furloughed September 14, and this furlough was extended.
 No. 128. Company B: Malaria, September 5; furloughed September 14, and this furlough was extended.
 No. 129. Company M: Typhoid fever, September 5; furloughed September 14.

No. 130. Company M: Typhoid fever, September 5; furloughed September 14.

No. 131. Company M: Malaria, September 5 to October 7.

No. 132. Company G: Malaria, September 6; not returned to duty October 31.

No. 133. Company L: Malaria, September 6 to October 5.

No. 134. Company E: Malaria, September 7 to October 23.

No. 135. Company G: Typhoid fever, September 8; furloughed September 14.

No. 136. Company A: Malaria, September 8; furloughed September 14. This furlough was extended, and the man was discharged October 8.

No. 137. Company D: Malaria, September 9; furloughed September 14, and this furlough was extended.

No. 138. Company I: Typhoid fever, September 9; furloughed October 7.

No. 139. Company A: Malaria, September 9; discharged October 12.

No. 140. Company D: Malaria, September 10; sent to division hospital September 30.

No. 141. Company E: Malaria, September 11; furloughed September 14, and this furlough was extended.

No. 142. Company E: Malaria, September 11; furloughed September 14, and this furlough was extended.

No. 143. Company I: Malaria, September 11 to 28.

No. 144. Company D: Malaria, September 11; furloughed October 24. This man was returned to duty October 9 and sent back to the hospital October 12, from which he was furloughed October 28.

No. 145. Company F: Typhoid fever, September 12; furloughed September 27.

No. 146. Company D: Typhoid fever, September 13; sent to division hospital September 30.

No. 147. Company D: Typhoid fever, September 13; furloughed October 12.

No. 148. Company I: Malaria, September 14 to October 8.

No. 149. Company F: Malaria, September 14 to October 4.

No. 150. Company E: Malaria, September 14 to October 4.

No. 151. Company G: Malaria, September 14 to October 8.

No. 152. Company B: Typhoid fever, September 15; furloughed October 15.

No. 153. Company M: Malaria, September 15 to October 9.

No. 154. Company E: Malaria, September 15; furloughed October 4.

No. 155. Company C: Malaria, September 15 to October 3.

No. 156. Company L: Malaria, September 15; discharged October 6.

No. 157. Company F: Malaria, September 15 to October 18.

No. 158. Company I: Malaria, September 16 to October 10.

No. 159. Company I: Malaria, September 16 to October 10.

No. 160. Company L: Malaria, September 16 to October 10.

No. 161. Company H: Malaria, September 16; still sick October 31.

No. 162. Company L: Malaria, September 16; sent to division hospital September 23. Here the disease was diagnosed as typhoid fever.

No. 163. Company E: Malaria, September 18; furloughed October 2.

No. 164. Company D: Typhoid fever, September 18; sent to division hospital September 26.

No. 165. Company A: Malaria, September 19 to October 8.

No. 166. Company K: Malaria, September 19 to October 8.

No. 167. Company K: Malaria, September 19 to October 10.

No. 168. Company B: Malaria, September 20 to October 18.

No. 169. Company F: Typhoid fever, September 20; furloughed November 18.

No. 170. Company C: Typhoid fever, September 21; furloughed October 24.

No. 171. Company F: Malaria, September 21; furloughed November 8. At the division hospital this case was diagnosed typhoid fever.

No. 172. Company M: Typhoid fever, September 22; furloughed October 5.

No. 173. Company F: Typhoid fever, September 22; furloughed October 19.

No. 174. Company I: Malaria, September 22; furloughed October 30.

No. 175. Company I: Malaria, September 24; furloughed November 30. At the division hospital this case was diagnosed typhoid fever.

No. 176. Company B: Malaria, September 24; still sick November 30.

No. 177. Company E: Malaria, September 24 to October 10.

No. 178. Company K: Malaria, September 25 to October 16.

No. 179. Company I: Malaria, September 25 to October 18.

No. 180. Company L: Malaria, September 25; furloughed October 6.

No. 181. Company M: Typhoid fever, September 26; furloughed October 27.

No. 182. Company K: Malaria, September 27 to October 24.

No. 183. Company M: Malaria, September 28; still sick November 30.

No. 184. Company L: Typhoid fever, September 29; sent to division hospital October 19.

No. 185. Company I: Typhoid fever, September 29; sick in quarters November 6.

No. 186. Company C: Malaria, September 29; sick in hospital October 31.

No. 187. Company I: Typhoid fever, September 29; disposition not given.

No. 188. Band: Malaria, September 30; sick in hospital October 31.

No. 189. Company D: Typhoid fever, October 1; sent to division hospital October 16.

No. 190. Company I: Malaria, October 2 to 31.

No. 191. Company D: Malaria, October 2 to 22.

No. 192. Company I: Malaria, October 3 to 26.

No. 193. Company D: Malaria, October 4; died at Knoxville, Tenn.; the date of death is not given.

No. 194. Company B: Malaria, October 5; furloughed October 19.

No. 195. Company K: Typhoid fever, October 7; sick in hospital October 31.

No. 196. Company D: Malaria, October 7; still sick November 30.

No. 197. Company H: Typhoid fever, October 7; furloughed October 28.

No. 198. Company I: Malaria, October 7; still sick October 31.

No. 199. Company A: Malaria, October 8; still sick November 30.

No. 200. Company I: Typhoid fever, October 8; furloughed November 1.

No. 201. Company F: Typhoid fever, October 9; sent to division hospital October 11.

No. 202. Company A: Malaria, October 9; furloughed October 21.

No. 203. Company F: Typhoid fever, October 9; sent to division hospital October 11.

No. 204. Company L: Typhoid fever, October 10; furloughed November 4.

No. 205. Company M: Typhoid fever, October 12; sick in hospital October 31.

No. 206. Company D: Typhoid fever, October 12; furloughed November 4.

No. 207. Company I: Typhoid fever, October 13; furloughed November 11.

No. 208. Company I: Typhoid fever, October 13; furloughed October 29.

No. 209. Company D: Typhoid fever, October 14; disposition not given.

No. 210. Staff: Malaria, October 16; still sick November 30.

No. 211. Company M: Typhoid fever, October 16; furloughed November 18.

No. 212. Company B: Typhoid fever, October 16; sent to division hospital October 27.

No. 213. Company H: Typhoid fever, October 18; furloughed November 15.

No. 214. Company D: Typhoid fever, October 19; sent to division hospital October 23.

No. 215. Company H: Typhoid fever, October 20; sent to division hospital October 26.

No. 216. Company E: Typhoid fever, October 20; furloughed November 20.

No. 217. Company H: Typhoid fever, October 21; sent to Fort Myer, November 2.

No. 218. Company I: Typhoid fever, October 23; furloughed November 21.

No. 219. Company D: Typhoid fever, October 25; disposition not given.

No. 220. Company I: Typhoid fever, October 26; sent to division hospital October 31.

No. 221. Company C: Typhoid fever, October 28; died November 11.

No. 222. Company E: Typhoid fever, October 30; sent to division hospital October 31.

The above list includes all probable cases of typhoid fever found on the regimental records from May 17 to October 31, inclusive. In addition to the above, we have found in the division hospital records of the following cases:

No. 223. Company F: Sent to division hospital October 11, with typhoid fever, and furloughed November 21.

No. 224. Company D: Sent to division hospital October 22, with gastro-enteritis, and furloughed November 18.

No. 225. Company A: Sent to division hospital August 2, with remittent malaria, and furloughed September 24.

No. 226. Company H: Sent to division hospital August 18, with remittent malaria, and furloughed August 24.

No. 227. Company D: Sent to division hospital September 24, with typhoid fever, and furloughed October 28.

No. 228. Company not given; sent to division hospital November 19, with typhoid fever.

No. 229. Company L: Sent to division hospital October 13, with remittent malaria, and furloughed October 24.

No. 230. Company I: Sent to division hospital September 2, with remittent malaria, and furloughed September 14.

No. 231. Company A: Sent to division hospital October 26, with typhoid fever and furloughed November 20.

No. 232. Company B: Sent to division hospital November 9, with typhoid fever, and furloughed November 23.

No. 233. Company B: Sent to Sternberg Hospital August 30, with continued malarial fever, and furloughed without date.

No. 234. Company D: Sent to division hospital August 8, with typhoid fever, and furloughed August 18.

No. 235. Company I: Sent to division hospital October 27, with typhoid fever, and furloughed November 21.

No. 236. Company M: Sent to division hospital November 10, with typhoid fever, and sent to Fort Myer November 20.

No. 237. Company C: Sent to division hospital October 19, with typhoid fever, and furloughed November 21.

No. 238. Company G: Sent to division hospital November 24, with typhoid fever.

No. 239. Company L: Sent to division hospital September 23, with typhoid fever; died October 4.

SUMMARY.

Assembled at Camp Eaton, Island Lake, Mich., in April, 1898.

Mustered into United States service May 8, 1898.

Arrived at Chickamauga Park May 17, 1898.

Strength on arrival, 1,019.

Date of first case of probable typhoid fever, June 1, 1898.

Date of first case of recognized typhoid fever, June 1, 1898.

Left Chickamauga Park August 21, 1898.

Strength on departure, 1,290.

Number of cases of probable typhoid fever developed at Chickamauga..... 95

Reached Knoxville, Tenn., August 22, 1898.

Number of cases of probable typhoid fever developed at Knoxville:

From August 22 to 31.....	26
During September.....	67
During October.....	51

Total number of cases of probable typhoid fever developed in this regiment from May to October..... 239

These 239 cases were diagnosed as follows:

Typhoid fever.....	86
Malaria.....	151
Gastro-enteritis.....	1
Indigestion.....	1
Total.....	239

This regiment remained in service until April, 1899, but we have not carried the study of its records beyond the October report.

When this regiment first reached Chickamauga Park it obtained its drinking water from a well, known as Jay's mill well. Just how long the use of water from this source continued we do not know, but it soon became evident that this well, if not already contaminated, would be likely to become so. The water was brought in barrels from springs outside the park, principally from Georgia Mineral Springs. There were some bored wells about the camp, and water from these was used also for a short time, but was discontinued on the suspicion that the water in them might become infected. We have endeavored to ascertain the exact date when this and other regiments of this division discontinued the well water and began to get their water supply from the springs.

Major Hysel, surgeon of this division, made a statement which may be condensed as follows:

I reached Chickamauga Park June 7, 1898. Some time during the last week of June I went to the camp of the Thirty-first Michigan Volunteer Infantry and found in the regimental hospital of that command two cases of typhoid fever. I began an investigation to find if possible the source of the infection in these cases. The colonel of the regiment told me that he believed the disease was due to impure water obtained from Jay's mill well. I immediately went to examine this well, and after seeing it I, too,

was convinced that the water in it might be contaminated. I had been led to believe that all the wells in the park were artesian, but this one certainly is not. It is a dug well, walled up with rock, and its location is such that it received the drainage from a brigade and from the corrals of the various regiments. The natural surface drainage from these sites converged at the well. I had the pump pulled out and ordered that the use of this water be discontinued. From this time on there was more or less typhoid fever in the Thirty-first Michigan Volunteer Infantry.

From this testimony it seems that the Thirty-first Michigan Volunteer Infantry continued to use water from Jay's mill well through the latter half of May and during the first three weeks of June. By reference to the list of cases of probable typhoid fever it will be seen that the first case in this regiment had its initial date June 1, 1898. It is probable that the infection in this case occurred before the regiment arrived at the park. Moreover, it is not probable that the water of this well was infected when the troops arrived. Up to that time there was nothing about the well likely to infect its contents. There were but few people in the park, and the workmen generally employed in making roads had used the water from this and other wells continuously for years, and General Boynton assured us that none of these workmen had ever developed typhoid fever. We think it highly improbable that the first case of typhoid fever in this regiment received its infection from this well. The hospital for this division was not established until June 14, and up to this time the sick in all the regiments were kept in regimental hospitals, and in the Thirty-first Michigan and the First Georgia, which came on the ground with typhoid fever June 17, the sick continued in the regimental hospitals. The regiments near Jay's mill well up to the last of June were the following: First West Virginia, Sixth Ohio, One hundred and fifty-eighth Indiana, One hundred and sixtieth Indiana, Thirty-first Michigan, and First Georgia. All of these commands, with the exception of the One hundred and sixtieth Indiana, had during this time one or more cases of typhoid fever. The probabilities are that if Jay's mill well was infected it received the infection from the troops. What are the probabilities that this did happen? In attempting to answer this question we will confine ourselves to the records of the Thirty-first Michigan. From July 6, 1898, typhoid fever became epidemic in this regiment, and 47 cases developed during the month of July. From this we can only say that it seems quite probable that the infection from this and the other regiments of the First and Second Brigades of the Second Division of the First Army Corps was returned to the troops of this and other regiments through the water of this well.

The testimony of Lieutenant-Colonel Shubel, of the Thirty-first Michigan, agrees quite accurately with that

of Major Hysel. Colonel Shubel informed us that the regiment continued to use the water from this well for six weeks after it arrived at the park.

The chance of pollution of the water from a well that received the drainage of this camp is shown by the testimony of Colonel Shubel concerning the sinks. He said:

We had great trouble while on this site in digging our sinks and we wrecked many shovels and picks in our attempts to dig them, and the results attained were not satisfactory.

This Jay's mill well was in a kind of swale in the road and all the overflow from the sinks above went around this well, and only the pump protruded above the water which had collected from the more elevated camp sites.

Captain Smith, of the Thirty-first Michigan, testified:

From my experience as officer of the day I can say that the water would sometimes get so deep around this well that one could see only the top of the pump. I have seen the water standing 3 feet deep for some distance around this well.

With the conditions as here described, it would hardly seem possible that the water of this well could escape infection with the specific germ of typhoid fever.

After the discontinuance of the well water, this regiment, as has been stated, hauled water in barrels from springs. Colonel Shubel stated that all the water brought from the springs was boiled, placed in barrels, which were surrounded with sawdust, and iced. Moreover, about the last of July or the 1st of August, the date can not be fixed exactly, this regiment was moved to another site quite distant from any other regiment. On August 21, this command was moved to Knoxville, Tenn. At this place it had an ideal camp site—plenty of most excellent water, and the soil permitted the construction of proper sinks. Notwithstanding these changes, typhoid fever continued quite unabated throughout August and September and was still epidemic throughout October.

At no time did this regiment have access to the water of Chickamauga Creek, which was piped through the other divisions of the First and Third Army Corps.

At the time of our inspection this regiment was under the care of a contract surgeon and the regimental hospital was not in good condition. For instance, there were four soiled bedpans not more than 10 feet from the ward, and these pans had not been cleaned and were filled with swarms of flies. Copperas only was used as a disinfectant.

We are quite confident that our list of cases of probable typhoid fever for this regiment is too small. The day before we inspected this command, 79 men had been sent home sick. Colonel Shubel reported to us 10 deaths up to that time (September 15, 1898). "Two officers had died from typhoid fever and at least a dozen had been sick with the disease." Our list contains the names of only three officers, two of whom died.

The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Austin, Earl Y.....	Pvt., G.	1899. Jan. 22	Sunfield, Mich.....	Typhoid.
Bond, Franklin	Pvt., M.	1898. Aug. 3	.....	Do.
Bartrem, Chas. E.....	Pvt., B.	Aug. 9	Chickamauga, Ga.....	Cerebro-spinal meningitis.
Boynton, .....	.....	Nov. 3	Knoxville, Tenn.....	Purpura hæmorrhagica.
Burns, Wm. C	Pvt., I.	Aug. —	.....	Typhoid.
Davis, Frank W	Pvt., M.	1899. Jan. 4	Knoxville, Tenn.....	Pneumonia.
Gray, Benj. H	Pvt., E.	Mar. 2	.....	Typhoid.
Fletcher, George W.....	Pvt., B.	Jan. 17	Camp Poland, Tenn.....	Pneumonia.
Fox, John W	Pvt., M.	1898. Dec. 30	Knoxville, Tenn.....	Typhoid.
Gray, Marvin	Band.	Aug. 16	Chattanooga, Tenn.....	Dysentery.
Gould, Henry.....	.....	Sept. 2	On train	Heart failure?
Grimes, Adelbert D.....	Pvt., F.	July 17	Camp Thomas, Ga.....	Typhoid.
Gutmann, John M.....	Capt., M.	July 13	Chattanooga, Tenn.....	Do.
Hawn, Rediford	Pvt., F.	Aug. —	.....	Do.
Keegan, Daniel	Pvt., M.	Dec. 12	Camp Poland, Tenn.....	Pneumonia.
Meginnis, Henry H.....	Pvt., F.	May 24	Chickamauga, Ga.....	Do.
Nash, Homer O.....	Staff.	Sept. —	.....	Typhoid.
Palmer, Homer O.....	Pvt., C.	Sept. 15	Regimental hospital.....	Do.
Pridil, William.....	Pvt., L.	Sept. 16	Chickamauga, Ga.....	Do.
Saunders, Henry D.....	Pvt., L.	July 22	Regimental hospital.....	Inflammation of bowels.
Sullivan, James A.....	Pvt., C.	Nov. 11	Camp Poland, Tenn.....	Typhoid.
Taylor, Hollis P	Pvt., C.	Sept. 15	Knoxville, Tenn.....	Typhoid and abscess of liver.
Tuttle, Guy.....	Corpl., G.	July 27	Camp Thomas, Ga.....	Enteric fever.
Von Waldenhausen, Fred.....	Pvt., A.	Sept. —	.....	Typhoid.
Waylett, Ernest E.....	Pvt., L.	Oct. 4	Camp Poland, Tenn.....	Typhoid.
Weldon, Norman E.....	Pvt., L.	Oct. 6	Knoxville, Tenn.....	Complication of diseases.
Wilcox, Lavergue H.....	Pvt., B.	Sept. 9	.....do	Dysentery.
Total deaths.....				27
Deaths due to typhoid fever.....				16
Percentage of deaths among probable cases of typhoid fever (239), 6.69.				
Percentage of deaths among recognized cases of typhoid fever (86), 18.60.				

COMMUNICATIONS FROM THE SURGEONS OF THE THIRTY-FIRST MICHIGAN VOLUNTEER INFANTRY.

Medical officers.

Charles D. W. Colby, major and surgeon, Jackson, Mich.
 Frank K. Owen, captain and assistant surgeon, Ypsilanti, Mich.
 Allen D. McLean, lieutenant and assistant surgeon, Detroit, Mich.

Major Colby makes the following statement:

The first camp of the Thirty-first Michigan at Chickamauga was on an elevation between two swales, which came together at the culvert near Jay's Mill. The swale back of headquarters drained the camp of the One hundred and sixtieth Indiana. The other, which ran between the end of company streets and company kitchens, drained division hospital camp and two corrals. After rains both of these swales would run full, and it was the coming together of these two streams which flooded the well and covered the pump at Jay's Mill. I have seen the company kitchen fires extinguished by this stream. The band was on the right of the regiment, and still farther to the right and near the swale was a slop sink, used by the band and one company (all the waste which could possibly be made to burn was put on fires after each meal, the fluid slops only being thrown in such sinks). The nature of the soil was such that the liquid was very slow in settling away, and on many occasions before filling the sink it had to be partly filled with brush to hold the dirt up and prevent liquid rising above the dirt as it was thrown in. I have seen these sinks filled and overflowing with the rain water as it

ran down the swale, causing such a stench that it drove the cooks out of the kitchens. The line of company kitchens stood at a slight angle to the road from Lytle to Jay's Mill, bringing the kitchen of the company on the left within 2 rods of the road, which between rains was exceedingly dusty. There was always a little water in the swale back of headquarters, and after a rain it would overflow its banks. When we arrived a number of the men obtained their drinking water by digging into the crevices between the rocks. This was soon condemned. The holes were enlarged, boxes sunk into them, and the water was used for washing purposes only. Soon after this we began hauling water from the big springs on the Ringold road (not the Georgia Mineral Spring). About the middle of June I was detailed for duty with the Reserve Ambulance Corps, First Army Corps, and from that time until November 3, when I was again on duty with the regiment, I know little of its history, except by hearsay. About December 1 our regimental hospital at Camp Poland was closed, because some one reported to Lieutenant-Colonel Wilcox, chief surgeon, on staff of Major-General Wilson, that we had 22 cases of typhoid fever. After being closed for nearly two weeks and after an investigation, which showed that we had no typhoid, was made, we were allowed to open it again. I always sent every suspicious case at once to division hospital.

Just as we were leaving for Cuba measles broke out in our camp, both at Knoxville and Savannah, and the disease went through the command quite generally, although most of the cases were mild. While at Knoxville we treated 18 or 20 cases of pneumonia in the regimental hospital, with 2 deaths. Colonel Gardner had a severe attack, and we cared for him at a hotel.

Upon our arrival at Cienfuegos all our sick were sent to the Sixth Ohio hospital, and, as soon as convalescent, forwarded to join the regiment at Amaro. Soon after arriving at Amaro we had a large number of cases of dengue, the patients returning to duty in from five to seven days after first chill.

The sanitary arrangements of our camp at Amaro were such that, when inspected by Colonel Greenleaf, he remarked: "This is certainly a beautiful camp; I have no fault to find and no suggestions to offer." Gonorrhea, and its complications, was always with us. One morning at sick call at Knoxville 24 men from one company came up with it. This is just a sample. Captain McLean, when asked by a friend what his duties were, replied that he was "genito-urinary surgeon" to the Thirty-first Michigan.

Of the hospital and sanitary arrangements on board transports and at Dafuskie Island, the less said the better.

ONE HUNDRED AND SIXTIETH INDIANA VOLUNTEER INFANTRY.

First Brigade, Second Division, First Army Corps.

This regiment reached Chickamauga Park, Ga., May 17, 1898.

The first report is signed by Assistant Surgeon Buehler, who makes the following statement:

There have been a great number of cases of diarrhea in the command, due to climatic changes and to the eating of strawberries. There has been one case of measles.

CONDENSED SICK REPORT FROM MAY 18 TO MAY 31, INCLUSIVE.

Mean strength	1,023
Diarrhea.....	1
Dysentery	2
Enteritis.....	2
Other diseases.....	16
Total	21

Evidently the great number of cases of diarrhea in the command referred to by the surgeon was not entered upon the sick report.

In the June report the assistant surgeon makes the following statement:

Diarrhea is still prevalent, but is on the decrease. Three cases of measles have appeared, but have been quarantined.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,290
Intermittent malaria	1
Remittent malaria	1
Enteritis	1
Febricula	1
Other diseases	21
Total	25

The case of intermittent malaria was off duty nine days, and the remittent malaria was of slight duration. The case of enteritis was of five days' duration, while that of febricula continued for two days. From this report there is no evidence of typhoid fever in this regiment at this time.

In the July report the assistant surgeon makes the following statement:

There has been quite an increase in malarial cases, principally of the remittent type, owing, we think, to our prolonged stay in one camp.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,310
Remittent malaria	17
Chronic diarrhea	1
Febricula	1
Other diseases	19
Total	38

The case of chronic diarrhea was that of a private in Company G, who reported sick July 4 and was sent to Fort Thomas July 7. One case of remittent fever, that of a private in Company K, was sent to Fort Thomas on the same day. Four of the cases of remittent malaria, not including the one already referred to, were of more than fourteen days' duration. Of these one each came from Companies E, K, A. and F.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength not given.	
Remittent malaria	21
Typhoid fever	5
Undetermined fever	3
Other diseases	12
Total	41

In the September report the assistant surgeon makes the following statement:

We have had a great increase in malarial fever of the remittent type, and also of typhoid fever, owing, we think, to the unsanitary condition of our previous camp at Newport News, Va., and also of this camp (the one at Lexington, Ky.) when we were first located upon it. At present, excellent sanitary conditions prevail here. Quite a number of our cases which we have diagnosed as remittent

malaria have turned out to be typhoid fever. Not being able to retain the sick in the regiment any length of time, it is impossible for us to diagnose these cases with any degree of certainty.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,304
Remittent malaria	81
Typhoid fever	7
Other diseases	26
Total	114

In the October report the surgeon makes the following statement:

A great many of the cases of malaria, so marked on this report, developed into typhoid fever. We could not hold the cases under observation a sufficient length of time to diagnose them with certainty. All sickness is on the decrease in this regiment. All sanitary precautions are being strictly enforced.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	913
Remittent malaria	17
Undetermined fever	18
Typhoid fever	1
Other diseases	14
Total	50

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

A.—At Chickamauga, Ga.

No. 1. Company G: Chronic diarrhea, July 4; sent to Fort Thomas July 6; discharged December 28.

No. 2. Company K: Remittent malaria, July 4 to 20.

No. 3. Company A: Remittent malaria, July 6 to 16.

No. 4. Company A: Typhoid fever, July 7; furloughed July 12. On the regimental records it appears that this man was returned to duty July 12.

No. 5. Company K: Remittent malaria, July 7; sent to Fort Thomas July 7. Here the disease was diagnosed typhoid fever, and the patient was furloughed July 30.

No. 6. Company A: Typhoid fever, July 7; still sick in quarters July 31.

No. 7. Company D: Malaria, July 8; still sick July 31.

No. 8. Company C: Malaria, July 9; still sick in quarters July 31.

No. 9. Company F: Remittent malaria, July 10 to 27.

No. 10. Company G: Remittent malaria, July 10; still sick in quarters July 31.

No. 11. Company F: Malaria, July 10; still sick in quarters July 31.

No. 12. Company A: Malaria, July 10; still sick July 31.

No. 13. Company H: Malaria, July 14; still sick in hospital July 31.

No. 14. Company C: Remittent malaria, July 14; furloughed from division hospital July 28.

No. 15. Company E: Remittent malaria, July 15; still sick July 31.

No. 16. Company B: Diarrhea, July 19; furloughed from division hospital September 10. In hospital this case was diagnosed typhoid fever.

No. 17. Company G: Remittent malaria, July 23; furloughed from division hospital August 12.

No. 18. Company L: Remittent malaria, July 27; still sick September 30.

No. 19. Company B: Remittent malaria, July 28; still sick September 30.

No. 20. Company D: Typhoid fever, July 28; still sick September 30.

No. 21. Company E: Typhoid fever, July 28; still sick September 30.

No. 22. Company K: Typhoid fever, July 28; still sick September 30.

No. 23. Company E: Typhoid fever, July 28; disposition not given.

B.—At Newport News, Va.

No. 24. Company K: Malaria, August 10; still sick October 31.

No. 25. Company H: Malaria, August 10; still sick October 31.

No. 26. Company G: Malaria, August 15; still sick October 31.

No. 27. Company H: Malaria, August 15; still sick October 31.

No. 28. Company H: Malaria, August 15; still sick October 31.

No. 29. Company H: Malaria, August 15; still sick October 31.

No. 30. Musician: Malaria, August 15; still sick October 31.

No. 31. Company D: Typhoid fever, August 15; sent to general hospital at Fortress Monroe; further disposition not given.

No. 32. Company B: Malaria, August 19; still sick September 30.

No. 33. Company G: Malaria, August 19; still sick September 30.

No. 34. Company E: Malaria, August 19; still sick September 30.

No. 35. Company D: Malaria, August 19; still sick September 30.

No. 36. Company C: Malaria, August 21; still sick September 30.

No. 37. Company L: Malaria, August 21; still sick September 30.

No. 38. Company B: Malaria, August 21; still sick October 31.

No. 39. Company B: Malaria, August 26; still sick October 31.

No. 40. Company E: Malaria, August 26; still sick October 31.

No. 41. Company B: Typhoid fever, August 26; sent to division hospital without date; further information concerning this patient is wanting.

No. 42. Company H: Typhoid fever, August 26; sent to division hospital; further disposition not given.

No. 43. Company not given: Typhoid fever, August 26; sent to division hospital; further information not given.

No. 44. Company H: Malaria, August 26; still sick October 31.

C.—At Lexington and subsequently.

No. 45. Company A: Malaria, August 30; still sick October 31.

No. 46. Company I: Malaria, August 30; still sick October 31.

No. 47. Company A: Malaria, August 31; still sick October 31.

No. 48. Company A: Malaria, August 31; still sick October 31.

No. 49. Company D: Malaria, August 31; still sick October 31.

No. 50. Company I: Typhoid fever, August 31; disposition not given.

No. 51. Company I: Remittent malaria, September 1; still sick October 31.

No. 52. Company A: Remittent malaria, September 1; still sick October 31.

No. 53. Company H: Malaria, September 1; still sick October 31.

No. 54. Company K: Malaria, September 1; still sick October 31.

No. 55. Company B: Remittent malaria, September 2; still sick October 31.

No. 56. Company I: Typhoid fever, September 2; furloughed October 30.

No. 57. Company H: Remittent malaria, September 3; still sick October 31.

No. 58. Company E: Remittent malaria, September 4; still sick October 31.

No. 59. Company D: Remittent malaria, September 4; still sick September 30.

No. 60. Company B: Remittent malaria, September 6; still sick October 31.

No. 61. Company K: Remittent malaria, September 6; still sick October 31.

No. 62. Company K: Remittent malaria, September 6; still sick October 31.

No. 63. Company I: Remittent malaria, September 6; still sick October 31.

No. 64. Company I: Remittent malaria, September 6; furloughed from division hospital October 8.

No. 65. Company B: Remittent malaria, September 7; still sick October 31.

No. 66. Company B: Remittent malaria, September 7; still sick October 31.

No. 67. Company G: Remittent malaria, September 7; still sick October 31.

No. 68. Company B: Remittent malaria, September 7; still sick October 31.

No. 69. Company C: Remittent malaria, September 7; still sick October 31.

No. 70. Company K: Remittent malaria, September 7; still sick October 31.

No. 71. Company B: Intermittent malaria, September 7; furloughed from division hospital October 27.

No. 72. Company G: Remittent malaria, September 8; still sick October 31.

No. 73. Company D: Remittent malaria, September 8; still sick October 31.

No. 74. Company I: Remittent malaria, September 8; still sick October 31.

No. 75. Company E: Remittent malaria, September 8; still sick October 31.

No. 76. Company F: Remittent malaria, September 8; still sick September 30.

No. 77. Company I: Remittent malaria, September 8; furloughed from division hospital October 24.

No. 78. Company L: Remittent malaria, September 10; still sick October 31.

No. 79. Company D: Remittent malaria, September 10; still sick October 31.

No. 80. Company B: Remittent malaria, September 10; still sick October 31.

No. 81. Company K: Remittent malaria, September 10; furloughed from division hospital October 13.

No. 82. Company D: Typhoid fever, September 10; furloughed from division hospital November 1.

No. 83. Company C: Remittent malaria, September 12; still sick October 31.

No. 84. Company E: Remittent malaria, September 12; still sick October 31.

No. 85. Company H: Remittent malaria, September 12; furloughed from division hospital October 8.

No. 86. Company B: Remittent malaria, September 12; furloughed from division hospital October 18.

No. 87. Company G: Typhoid fever, September 12; furloughed from division hospital October 12.

No. 88. Company A: Remittent malaria, September 13; furloughed from division hospital October 13.

No. 89. Company I: Remittent malaria, September 14; still sick October 31.

No. 90. Company H: Remittent malaria, September 14; still sick October 31.

No. 91. Musician: Typhoid fever, September 14; disposition not given.

No. 92. Musician: Typhoid fever, September 14; furloughed from division hospital October 27.

No. 93. Company L: Remittent malaria, September 15; still sick October 31.

No. 94. Company H: Remittent malaria, September 15; still sick October 31.

No. 95. Company A: Typhoid fever, September 15; disposition not given.

No. 96. Company A: Typhoid fever, September 15; furloughed from division hospital October 28.

No. 97. Company K: Remittent malaria, September 16; still sick October 31.

No. 98. Company A: Typhoid fever, September 16; furloughed from division hospital October 27.

No. 99. Company D: Remittent malaria, September 17; still sick October 31.

No. 100. Company I: Remittent malaria, September 17; still sick in division hospital September 30.

No. 101. Company I: Remittent malaria, September 17; sent to Fort Thomas November 5.

No. 102. Company A: Remittent malaria, September 18; still sick October 31.

No. 103. Company K: Remittent malaria, September 18; still sick October 31.

No. 104. Company C: Remittent malaria, September 18; still sick October 31.

No. 105. Company L: Typhoid fever, September 19; sent to division hospital; further disposition is not given.

No. 106. Company I: Remittent malaria, September 19; still sick October 31.

No. 107. Company G: Remittent malaria, September 20; still sick October 31.

No. 108. Company K: Remittent malaria, September 20; still sick October 31.

No. 109. Company G: Remittent malaria, September 20; still sick October 31.

No. 110. Company K: Remittent malaria, September 20; still sick October 31.

No. 111. Company L: Remittent malaria, September 20; still sick October 31.

No. 112. Company A: Remittent malaria, September 20; still sick October 31.

No. 113. Company B: Remittent malaria, September 20; still sick October 31.

No. 114. Company K: Remittent malaria, September 20; furloughed from division hospital October 27.

No. 115. Company G: Typhoid fever, September 20; furloughed from division hospital October 17.

No. 116. Company L: Typhoid fever, September 20; died in division hospital October 13.

No. 117. Company A: Remittent malaria, September 20; furloughed from division hospital October 8.

No. 118. Company D: Remittent malaria, September 21; still sick October 31.

No. 119. Musician: Remittent malaria, September 21; still sick October 31.

No. 120. Company L: Remittent malaria, September 21; still sick October 31.

No. 121. Musician: Remittent malaria, September 21; furloughed from division hospital October 9.

No. 122. Company M: Remittent malaria, September 22; still sick October 31.

No. 123. Musician: Remittent malaria, September 22; still sick October 31.

No. 124. Musician: Remittent malaria, September 22; still sick October 31.

No. 125. Company K: Remittent malaria, September 23; still sick October 31.

No. 126. Company D: Remittent malaria, September 23; still sick October 31.

No. 127. Company D: Remittent malaria, September 23; still sick October 31.

No. 128. Company B: Remittent malaria, September 23; still sick October 31.

No. 129. Company G: Remittent malaria, September 23; still sick October 31.

No. 130. Company H: Typhoid fever, September 23; still sick October 31.

No. 131. Company L: Remittent malaria, September 23; still sick October 31.

No. 132. Company K: Typhoid fever, September 23; furloughed from division hospital October 24.

No. 133. Company K: Remittent malaria, September 24; still sick October 31.

No. 134. Company M: Remittent malaria, September 24; sent to Fort Thomas November 2; discharged December 3. At Fort Thomas this case was diagnosed typhoid fever.

No. 135. Company M: Remittent malaria, September 24; still sick October 31.

No. 136. Company A: Remittent malaria, September 24; sent to Fort Thomas November 5.

No. 137. Company B: Remittent malaria, September 24; sent to Fort Thomas November 5.

No. 138. Company A: Remittent malaria, September 24; sent to Fort Thomas November 5.

No. 139. Company C: Intestinal hemorrhage, September 24; furloughed from division hospital October 17.

No. 140. Company E: Typhoid fever, September 25; disposition not given.

No. 141. Company L: Indigestion, September 26; furloughed from division hospital October 16.

No. 142. Company L: Remittent malaria, September 26; still sick October 31.

No. 143. Company A: Remittent malaria, September 27; still sick October 31.

No. 144. Company I: Remittent malaria, September 27; still sick October 31.

No. 145. Company M: Remittent malaria, September 28; still sick October 31.

No. 146. Company D: Remittent malaria, September 29; still sick October 31.

No. 147. Company C: Remittent malaria, September 29; still sick October 31.

No. 148. Company M: Remittent malaria, September 29; still sick October 31.

No. 149. Company K: Remittent malaria, September 29; still sick October 31.

No. 150. Company M: Remittent malaria, September 29; still sick October 31.

No. 151. Company C: Remittent malaria, September 29; still sick October 31.

No. 152. Company C: Remittent malaria, September 29; still sick October 31.

No. 153. Company A: Remittent malaria, September 29; still sick October 31.

No. 154. Company C: Remittent malaria, September 29; still sick October 31.

No. 155. Company L: Remittent malaria, September 29; still sick October 31.

No. 156. Company M: Remittent malaria, September 29; still sick October 31.

No. 157. Company A: Remittent malaria, September 30; sent to Fort Thomas November 2; died at Fort Thomas November 9. At Fort Thomas this case was diagnosed typhoid fever.

No. 158. Company H: Remittent malaria, September 30; sent to Fort Thomas November 5 and furloughed November 15. At Fort Thomas this case was diagnosed typhoid fever.

No. 159. Company M: Malaria, September 30; still sick October 31.

No. 160. Company A: Remittent malaria, September 30; still sick October 31.

No. 161. Company A: Remittent malaria, September 30; sent to Fort Thomas November 2; returned to duty December 3.

No. 162. Company L: Typhoid fever, September 30; not accounted for in October record.

No. 163. Company I: Typhoid fever, September 30; not accounted for in October record.

No. 164. Company C: Remittent malaria, September 30; still sick October 31.

No. 165. Company M: Catarrhal jaundice, September 30; still sick in division hospital October 16.

No. 166. Company F: Remittent malaria, September 30; returned to duty December 3. In hospital this case was diagnosed typhoid fever.

No. 167. Company C: Remittent malaria, October 1; still sick October 31.

No. 168. Company G: Remittent malaria, October 1; returned to duty November 21.

No. 169. Company E: Remittent malaria, October 1 to November 23.

No. 170. Company L: Malaria, October 2; furloughed from Fort Thomas November 17. At Fort Thomas this case was diagnosed typhoid fever.

No. 171. Company G: Malaria, October 3; still sick October 31.

No. 172. Company I: Malaria, October 3; still sick October 31.

No. 173. Company I: Remittent malaria, October 3; furloughed from division hospital October 15.

No. 174. Company E: Typhoid fever, October 4 to December 3.

No. 175. Company M: Remittent malaria, October 4; still sick October 31.

No. 176. Company K: Remittent malaria, October 5; still sick October 31.

No. 177. Company M: Remittent malaria, October 5; still sick October 31.

No. 178. Company G: Remittent malaria, October 6; still sick October 31.

No. 179. Company G: Remittent malaria, October 6; still sick October 31.

No. 180. Company M: Remittent malaria, October 6; still sick October 31.

No. 181. Company B: Remittent malaria, October 8; still sick October 31.

No. 182. Company A: Malaria, October 8; still sick October 31.

No. 183. Company K: Malaria, October 8; still sick October 31.

No. 184. Company K: Malaria, October 8; still sick October 31.

No. 185. Company A: Malaria, October 8; sent to Fort Thomas November 2. At Fort Thomas this case was diagnosed typhoid fever.

No. 186. Company A: Malaria, October 8 to November 13.

No. 187. Company B: Remittent malaria, October 8; still sick October 31.

No. 188. Company F: Remittent malaria, October 9; discharged from Fort Thomas November 22.

No. 189. Company I: Malaria, October 9; still sick October 31.

No. 190. Company I: Intermittent malaria, October 9; still sick October 31.

No. 191. Company A: Malaria, October 10; still sick October 31.

No. 192. Company E: Remittent malaria, October 10; furloughed from division hospital October 27.

No. 193. Company A: Malarial fever, October 12; sent to Fort Thomas November 2.

No. 194. Company I: Malaria, October 13; still sick October 31.

No. 195. Company C: Typhoid fever, October 14; disposition not given. This man is reported to have been convalescent from typhoid fever when received at the hospital October 14. There is no record of previous illness.

No. 196. Company C: Remittent malaria, October 14; still sick October 31.

No. 197. Company B: Malarial fever, October 16 to December 4.

No. 198. Company M: Malaria, October 18; still sick October 31.

No. 199. Company G: Malarial fever, October 19; furloughed from Fort Thomas December 27. At Fort Thomas this case was diagnosed typhoid fever.

No. 200. Company A: Malaria, October 19; still sick at Fort Thomas November 30.

No. 201. Company H: Malaria, October 20; still sick October 31.

No. 202. Company H: Malaria, October 20; sent to Fort Thomas November 3.

No. 203. Company K: Typhoid fever, October 20; still sick in quarters October 29.

No. 204. Company F: Malaria, October 21; still sick October 31.

No. 205. Company B: Malaria, October 22; still sick October 31.
No. 206. Company K: Malaria, October 23; still sick October 31.
No. 207. Company G: Malarial fever, October 24; still sick October 31.

No. 208. Company E: Malaria, October 24; still sick October 31.

No. 209. Company D: Malaria, October 25; discharged from Fort Thomas December 28. At Fort Thomas this case was diagnosed typhoid fever.

No. 210. Company F: Malarial fever, October 25; still sick November 30.

No. 211. Company B: Remittent malaria, October 25; discharged from Fort Thomas December 27.

No. 212. Company A: Malaria, October 25; still sick November 30.

No. 213. Company D: Malaria, October 25; still sick November 30.

No. 214. Company E: Typhoid fever, October 25; sent to Fort Thomas November 2.

No. 215. Company G: Typhoid fever, November 2; furloughed from Fort Thomas November 16.

No. 216. Company L: Typhoid fever, November 2; still sick at Fort Thomas November 30.

No. 217. Company K: Remittent malaria, November 2 to December 4.

No. 218. Company F: Typhoid fever, November 2; discharged from Fort Thomas December 3.

No. 219. Company F: Typhoid fever, November 2; furloughed from Fort Thomas November 21.

No. 220. Company E: Typhoid fever, November 5; discharged from Fort Thomas December 16.

No. 221. Company H: Typhoid fever, November 5; furloughed from Fort Thomas November 28.

No. 222. Company C: Remittent malaria, November 5; still sick at Fort Thomas November 30.

No. 223. Company D: Typhoid fever, November 8; furloughed from division hospital November 11.

SUMMARY.

Assembled near Indianapolis, Ind., in April, 1898.

Mustered into United States service early in May, 1898.

Arrived at Chickamauga Park May 17, 1898.

Strength on arrival, 1,023.

Date of first case of probable typhoid fever, July 4, 1898.

Date of first case of recognized typhoid fever, July 7, 1898.

Left Chickamauga Park July 28, 1898.

Strength on departure, 1,312.

Number of cases of probable typhoid fever developed at Chickamauga..... 23

Arrived at Newport News, Va., July 28, 1898.

Left Newport News, Va., August 26, 1898.

Number of cases of probable typhoid fever developed at Newport News, Va..... 21

Arrived at Lexington, Ky., August 30, 1898.

Number of cases of probable typhoid fever developed at Lexington:

From August 30 to 31..... 6

During September..... 116

During October..... 48

From November 1 to 8..... 9

Total number of cases of probable typhoid fever developed in the One hundred and sixtieth Indiana from

May to November, 1898..... 223

These 223 cases were diagnosed as follows:

Typhoid fever..... 47

Malaria..... 172

Diarrhea..... 1

Indigestion..... 1

Intestinal hemorrhage..... 1

Catarrhal jaundice..... 1

Total..... 223

Apparently this was one of the very few volunteer regiments that reached Chickamauga without any of its members being infected with typhoid fever. By reference to the list of probable cases, it will be seen that the first suspicious case was diagnosed chronic diarrhea. It is possible that other cases of prolonged diarrhea were not recorded and consequently have escaped detection.

From the figures given showing the mean strength for the different months, it appears that this regiment received recruits during the months of May, June, and July. Whether the first cases of protracted fever in this command occurred among the recruits or among those who went to Chickamauga originally with the regiment, we have no means of determining.

Giving our attention to the 23 cases that developed at Chickamauga, we find that the most of these occurred in three groups in point of time. From July 4 to 10, inclusive, there were 12 cases. On July 14 and 15 there were 3 cases. On July 27 and 28 there were 6 cases. It will thus be seen that these three groups contained 21 out of the 23 cases. However, we must not lay too much stress upon this point. On the day of leaving Chickamauga, July 28, 1898, it is probable that all the sick, including those who had not been feeling well for some days, were sent to hospital, and this may account for one of the groups. In other words, we can not be certain that the dates given are the exact initial dates of all the cases. Studying these cases by companies, we find that Companies I and M remained free from typhoid fever when the regiment left Chickamauga. The first case in Company I occurred August 30, and then for three successive days there was a new case each day from this company. Company M seems to have escaped typhoid fever altogether until September 22, 1898. From this time on Company M seems to have furnished its proportion, although the total for this company is not so great as for some others. It would be interesting if we could know the position of the mess tents of this company with reference to the sinks at Chickamauga Park and at Newport News.

From the list of probable cases it appears that this regiment was free from typhoid fever for about twelve days directly after reaching Newport News. If this were true, the inference would follow that but few infected persons went with the regiment from Chickamauga to Newport News. However, we are not sure that the break in the records is due to the temporary abeyance of typhoid fever or to an interruption in the keeping of the records. On leaving Newport News and going to Lexington, Ky., the break in the list of cases of probable typhoid fever is much shorter.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Altenback, Henry S.	Pvt., K.	1898. July 30	Chickamauga, Ga.	Cerebral congestion.
Baker, Judson J.	Pvt., G.	Dec. 4	Columbus, Ga.	Typhoid and meningitis.
Bigley, Roy R.	Corpl., A.	Nov. 9	Division hospital.	Typhoid and peritonitis.
Cole, Eugene L.	Sgt. maj.	Sept. 3	Marion, Ind.	Pernicious malaria.
Lucas, Converse.	Pvt., F.	Nov. 7	Fort Thomas, Ky.	Typhoid.
Paul, Hamilton B.	Pvt., H.	June 14	Camp Thomas, Ga.	Congestion of the brain.
Rizer, Orestes D.	Pvt., M.	Nov. 8	Camp Hamilton, Ky.	Typhoid.
Rosebraugh, Frank ..	Pvt., K.	July 22	.....	Injury to spine.
Sapp, Silas C.	Sgt., H.	Sept. 15	Camp Hamilton, Ky.	Typhoid.
Vawter, George.	Pvt., I.	Oct. 9	Camp Hamilton, Lexington, Ky.	Do.
Wynn, Osear.	Pvt., L.	Oct. 13	.....do.....	Do.
Total deaths				11
Deaths due to typhoid fever				8
Percentage of deaths among probable cases of typhoid fever (223), 3.58.				
Percentage of deaths among recognized cases of typhoid fever (47), 17.02.				

COMMUNICATIONS FROM THE SURGEONS OF THE ONE HUNDRED AND SIXTIETH INDIANA VOLUNTEER INFANTRY.

Medical officers.

John J. Kyle, major and surgeon, Marion, Ind.

Frank W. Foxworthy, captain and assistant surgeon, Indianapolis, Ind.

Eugene Buehler, first lieutenant and assistant surgeon, Indianapolis, Ind.

Lieutenant Buehler states:

Our first camp was at Chickamauga. Little need be said of this camp, as the ground has been thoroughly covered. As to the sanitation of the camp, very little was done. Requisitions were made for disinfectants, especially for chloride of lime, but this was refused on the ground of its being an old-fashioned idea. The lime, we were told, was to be used for cleaning the hospital furniture only. We were instructed to dig sinks from 8 to 10 feet deep, and as the bottom was covered we were to throw dry earth upon it. This answered fairly well until the heavy rains set in. The sinks were soon filled with water, and the offal floated out upon the surroundings. Myriads of flies settled on this and maggots without number were developed, and the stench often became unbearable.

We made requisition for lumber to inclose the sinks, but this was also refused. Lumber was bought by the regiment, however—just enough to shield the men from public view.

The condition of the kitchen sinks was on the same order. The water for the camp was hauled about 4 miles from springs, and was fairly good. However, the mode of transporting the same was objectionable, for the reason that the men hauling it were not cleanly in handling the barrels, and very often neglected to cover the barrels, so permitting the dust from the roads to settle in them.

The bathing facilities were limited. The creek nearby soon became so filthy that the men refused to bathe in it.

The tents were without floors, the men being obliged to sleep upon the ground. This state of affairs lasted throughout our stay at Chickamauga.

Our next camp was at Newport News, Va. Here, as at our

former camp, the sanitary conditions were very poor. This, however was largely due to the fact that we only expected to remain a few days, as we were to go on the transports. The order was revoked and we camped here nearly five weeks. Supplies were very scarce.

Owing to the disappointment of our not going to the front, discipline became lax and orders as to simple sanitary laws were disregarded.

All food was hauled in open wagons which were used for all purposes. Very often bread and meat would come in covered with dust. The water was hauled in barrels.

Our next camp was at Lexington, Ky. This was an ideal camp location. Rigid sanitation was here enforced. All sinks were carefully inclosed and disinfection was probably overdone, as bichloride of mercury, sulphate of iron, chloride of lime, crude oil, and quicklime were required to be thrown into the sinks three times a day. Each tent had its floor, which was mopped twice a week with bichloride of mercury and the floors moved aside to sprinkle the ground beneath with chloride of lime.

The water supply was run in pipes from the city supply to the foot of each company street. Bath houses were erected and the men were compelled to bathe every other day. We were not allowed to remain long in this camp, it being too far from headquarters.

We were ordered to move to a site previously occupied by the Fourteenth Minnesota. This site was in a fearful condition, there having been 40 cases of typhoid fever in this regiment, which had not been sent to the general hospital, but were permitted to remain here at least a week before they were moved.

The excretions from these cases were thrown into the sinks. Our sickness soon began. Whether it was due to this fact or that disease was dormant in the men, was undetermined. At any rate, the first cases of typhoid fever in our regiment became manifest, the sickness before this having been only of intestinal and malarial nature. We had more sickness at this camp than at the other two combined, notwithstanding the fact that every precaution was taken to put the camp in as sanitary a condition as possible.

Our next camp was at Columbus, Ga. This was ideal in every respect. All sinks and tent floors, both for kitchen and the men, were built and put into position before the ground was occupied by the regiment. The water supply was excellent and was also supplied by the city as at Lexington. The same precautions as to disinfection were carried out and sickness visibly decreased. From here we were sent to Matanzas, Cuba.

The regiment was in better health at this place than at any time since mustered in. Only 15 men were in the hospital during our stay of nearly three months. This was largely due to the fact that all refuse was thrown directly into the sea. The sinks were built upon ledges of rock overhanging the sea. The outgoing tide carried everything with it. The water was hauled as in the other cases. I neglected to state that orders had been issued to boil and filter all the water. This was done whenever practicable. However, very often filters were not supplied nor kettles provided for boiling the water as frequently as required.

Notwithstanding the fact that orders were issued to drink only boiled water, the men would drink water from neighboring springs which might easily have become contaminated. Guards were placed to prevent this, wherever it was possible; but it is obvious that each man could not be watched.

Taking all things into consideration, the health in our regiment was remarkable, there being only 12 deaths in the entire regiment of 1,326 men in a full year's service. Two of these deaths were accidental.

Major Kyle thinks the estimate of 223 cases of typhoid fever in this regiment altogether too high. He states that at Chickamauga this regiment was encamped in the rear of and below the Second Division hospital and that it received the drainage from the sinks of this hospital. He is inclined to believe also that a driven well within the regimental lines was contaminated by the drainage from the hospital. He states that the sinks of Company M were within 100 feet of cooking quarters. Jay's Mill well was so located that it received the sewage from the hospital of the Second Division as well as from the sinks of the One hundred and sixtieth Indiana and the Thirty-first Michigan.

The cases of typhoid fever in this regiment that occurred at Matanzas, Cuba, are attributed to infected drinking water obtained in transit from Columbus, Ga., to Charleston, S. C.

FIRST GEORGIA VOLUNTEER INFANTRY.

First Brigade, Second Division, First Army Corps.

This regiment assembled at Camp Northen, Griffin, Ga., and the first sick report covers the month of May. This report is signed by Major Garrard, who makes the following statement:

Diarrhea in an active form seemed to be on the increase, when the water was examined and found to be the cause. After this the water was boiled. There are a few cases of intermittent malaria. The regiment is composed of middle and south Georgians. Quinine has been freely used.

CONDENSED SICK REPORT FOR MAY.

Mean strength	1,014
Intermittent malaria	4
Remittent malaria	6
Diarrhea	4
Other diseases	3
Total	17

The first record made on this report dates May 16. Every case reported is complete, and with the exception of two cases of injury the longest period during which one was excused from duty was six days. This happened in a case of so-called malarial fever. The man reported sick May 18 and returned to duty May 24. There is no evidence of the existence of typhoid fever in this regiment during the month of May. It would be interesting to know how it was determined that the water was the cause of the diarrhea, but the surgeon fails to state this.

In the June report the surgeon makes the following statement:

Malaria is due to the high altitude, damp nights and cool mornings. Diarrhea is probably due to the same cause. Our cooking is improving. We have had a few cases of measles.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1, 121
Intermittent malaria.....	10
Remittent malaria.....	12
Acute diarrhea.....	11
Dysentery.....	5
Other diseases.....	20
Total.....	58

This regiment reached Chickamauga Park, Ga., June 17, coming just a month later than the other two regiments of the same brigade.

In the July report Surgeon Garrard states:

Measles were probably brought to the camp by recruits. I think that the high altitude of Chickamauga Park develops the malaria that the men brought from their homes.

CONDENSED SICK REPORT FOR JULY.

Mean strength not given.	
Intermittent malaria.....	35
Acute diarrhea.....	7
Dysentery.....	2
Typhoid fever.....	3
Other diseases.....	19
Total.....	66

Every case of malaria in this regiment is marked "quotidian." Some of these are suspiciously like typhoid fever; some of the cases of diarrhea and dysentery are also suspiciously like typhoid. Instances of both of these will be given in our list of typhoid cases. The hospital records show that Leiter Hospital received three cases of typhoid fever from this regiment during the month of July. Two of these do not occur upon the regimental report. The Second Division, First Army Corps, Hospital received from this regiment during the month of July five recognized cases of typhoid fever. Confirmation of this statement may be had by examining the list of typhoid cases.

The August report is signed without comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength.....	1, 207
Intermittent malaria.....	49
Acute diarrhea.....	6
Dysentery.....	1
Typhoid fever.....	7
Other diseases.....	16
Total.....	79

The small number of cases contained in this regiment is evidently due to the fact that hospital cases only were recorded. It must not be supposed from the small number of sick reported that the sickness in this regiment was actually much less than it was in other regiments.

This regiment left Chickamauga Park, Ga., August 21 and proceeded to Knoxville, Tenn.

The September report is signed without comment.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength.....	1, 229
Intermittent malaria.....	16
Acute diarrhea.....	2
Dysentery.....	2
Typhoid fever.....	4
Other diseases.....	43
Total.....	67

The regiment during this month was in charge of Lieut. William J. Little. Like the record of the preceding month, this report contains only hospital cases. This regiment, it should be understood, maintained a regimental hospital, and sent the sick only in case of prolonged illness to the division hospital. About September 23 this regiment moved from Camp Poland, near Knoxville, to Camp Price, near Macon, Ga. It is an interesting observation that, notwithstanding the fact that the regimental surgeon had been changed three times, each continues to diagnose all malarias as "quotidian." Indeed it would seem that the hospital steward filled in many of these diagnoses without any special medical advice. We inspected this regiment at Camp Poland and saw in the regimental hospital more cases which we should diagnose from clinical observation as "typhoid" fever on that day than are reported for the entire month.

In October Major Garrard apparently resumed charge of this regiment. He states that the adjutant of the regiment was unable to furnish a statement of the number of men in the command for the month of October and that he has no record, and that all the men were supposed to be on furlough. A detail of six men from each company was left to guard the camp. Malaria continues and mumps are prevalent in the regiment. Typhoid fever developed at Chickamauga, was carried to Knoxville, and since leaving the latter place only sporadic cases have occurred. Only two cases of recognized typhoid fever appear in this regiment. Both of these are brought over from September, but, if this report be correct, there was during the month of October no typhoid fever developed in this regiment. However, as has been stated, the regiment was on furlough, and it is supposed that the record covers only the detail left to take care of the camp. One death from mumps is reported. This was a private in Company M, who died October 3.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength not given.	
Intermittent malaria.....	17
Acute diarrhea.....	1
Dysentery.....	1
Typhoid fever.....	2
Other diseases.....	16
Total.....	37

The following is a list of the recognized and probable cases of typhoid fever found in the records of this regiment:

A.—At Camp Northern, Ga.

No. 1. Company G: Sent to hospital without diagnosis June 6. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 21.

No. 2. Company A: Diarrhea, June 6 to 17.

No. 3. Company G: Diarrhea, June 6 to 17.

No. 4. Company G: Sent to hospital without diagnosis June 11. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 21.

No. 5. Company E: Sent to hospital without diagnosis June 11. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 25.

No. 6. Company G: Sent to hospital without diagnosis June 16. Here the disease was diagnosed typhoid fever, and the patient returned to duty September 20.

No. 7. Company A: Sent to hospital without diagnosis June 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed in July. Exact date not given.

B.—At Chickamauga, Ga.

No. 8. Company G: Sent to hospital without diagnosis June 17. Here the disease was diagnosed typhoid fever, and the patient died August 25.

No. 9. Company H: Sent to hospital without diagnosis June 17. Here the disease was diagnosed malarial fever, and the patient was furloughed August 4.

No. 10. Staff: Sent to hospital without diagnosis June 17. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 12.

No. 11. Company D: Malaria June 28; still sick in division hospital July 31.

No. 12. Company E: Sent to division hospital without diagnosis June 28. Here the disease was diagnosed diarrhea, and the patient was still sick August 31.

No. 13. Company I: Sent to Leiter Hospital without diagnosis July 2. Here the disease was diagnosed malaria, and the patient was furloughed July 11.

No. 14. Company F: Malaria, July 2; died in division hospital August 9. In hospital this case was diagnosed typhoid fever.

No. 15. Company F: Malaria, July 2; furloughed from Leiter Hospital August 10.

No. 16. Company E: Sent to division hospital without diagnosis July 2. Here the disease was diagnosed malaria, and the patient was still sick July 31.

No. 17. Company I: Sent to Leiter Hospital without diagnosis July 2. Here the disease was diagnosed malaria, and the patient was furloughed August 10.

No. 18. Band: Sent to division hospital without diagnosis July 2. Here the disease was diagnosed malaria, and the patient was furloughed July 30.

No. 19. Company G: Sent to Leiter Hospital without diagnosis July 3. Here the disease was diagnosed typhoid fever, and the patient died July 26.

No. 20. Company L: Diarrhea, July 3; still sick in division hospital July 31.

No. 21. Company C: Sent to Leiter Hospital without diagnosis July 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 22. Company M: Sent to division hospital without diagnosis July 3. Here the disease was diagnosed malaria, and the patient was furloughed July 20.

No. 23. Company A: Sent to division hospital without diagnosis July 4. Here the disease was diagnosed malaria, and the patient was furloughed July 31.

No. 24. Company C: Malaria, July 4; furloughed from division hospital July 26.

No. 25. Company L: Sent to division hospital without diagnosis July 4; transferred to Fort Thomas July 5. Here the disease was diagnosed typhoid fever, and the patient was returned to duty September 17.

No. 26. Company G: Malaria, July 4; still sick in division hospital July 31.

No. 27. Company D: Sent to division hospital without diagnosis July 4; transferred to Fort Thomas. Here the disease was diagnosed typhoid fever, and the man was returned to duty September 14.

No. 28. Company D: Malaria, July 4; still sick in division hospital July 31.

No. 29. Company L: Sent to Fort Thomas without diagnosis July 5. Here the disease was diagnosed typhoid fever, and the patient was discharged October 6.

No. 30. Company G: Typhoid fever, July 5; died in division hospital July 21.

No. 31. Company B: Typhoid fever, July 6; furloughed from division hospital July 16.

No. 32. Company E: Sent to division hospital without diagnosis July 6. Here the disease was diagnosed malaria, and the patient was still sick in hospital July 31.

No. 33. Company not given: Malaria, July 7; still sick in division hospital July 31.

No. 34. Company G: Malaria, July 9; still sick in division hospital July 31.

No. 35. Company I: Sent to division hospital without diagnosis July 10. Here the disease was diagnosed continued malaria, and the patient was furloughed July 31.

No. 36. Company E: Malaria, July 12; still sick in division hospital July 31.

No. 37. Company C: Typhoid fever, July 13; furloughed from Sternberg Hospital August 31.

No. 38. Company G: Malaria, July 15; still sick in division hospital July 31.

No. 39. Company A: Dysentery, July 16; still sick in division hospital July 31.

No. 40. Company D: Malaria, July 18; still sick in division hospital July 31. In hospital this case was diagnosed typhoid fever.

No. 41. Company D: Sent to division hospital without diagnosis July 18. Here the disease was diagnosed dysentery, and the patient was still sick August 31.

No. 42. Company B: Typhoid fever, July 19; still sick in division hospital August 31. This man was kept in the regiment until August 3.

No. 43. Company M: Malaria, July 21; furloughed August 10.

No. 44. Company D: Malaria, July 22; furloughed August 12.

No. 45. Company I: Sent to division hospital without diagnosis July 27. Here the disease was diagnosed malaria, and the patient was furloughed August 20.

No. 46. Company E: Sent to division hospital without diagnosis July 27. Here the disease was diagnosed malaria, and the patient was still sick August 31.

No. 47. Company M: Malaria, July 27; furloughed from division hospital August 29. In hospital this case was diagnosed typhoid fever.

No. 48. Company F: Sent to division hospital without diagnosis July 28. Here the disease was diagnosed typhoid fever, and the patient was still sick July 31.

No. 49. Company not given: Malaria, July 28; still sick in division hospital August 31.

No. 50. Company D: Sent to division hospital without diagnosis July 29. Here the disease was diagnosed dysentery, and the patient died August 12.

No. 51. Company D: Sent to division hospital without diagnosis August 1. Here the disease was diagnosed enteritis, and the patient was furloughed August 20.

No. 52. Company K: Sent to division hospital without diagnosis August 1. Here the disease was diagnosed enteritis, and the patient was furloughed August 13.

No. 53. Company not given: Malaria, August 2; still sick in division hospital August 31.

No. 54. Company A: Malaria, August 2; still sick in division hospital August 31. This man is recorded as having had malaria July 24 to 31. He probably had typhoid fever, the initial date of which was July 24.

No. 55. Company not given: Diarrhea, August 3; still sick August 31.

No. 56. Company K: Sent to division hospital without diagnosis August 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 12.

No. 57. Company D: Malaria, August 4; furloughed from division hospital September 10. In hospital this case was diagnosed typhoid fever.

No. 58. Company M: Malaria, August 6; still sick in division hospital August 31.

No. 59. Company not given: Malaria, August 8; still sick in division hospital August 31.

No. 60. Company not given: Malaria, August 8; still sick in division hospital August 31.

No. 61. Company L: Malaria, August 8; still sick in division hospital August 31.

No. 62. Company L: Malaria, August 8; still sick in division hospital August 31.

No. 63. Company C: Malaria, August 10; still sick in division hospital August 31.

No. 64. Company E: Malaria, August 11; furloughed from division hospital August 29.

No. 65. Company C: Malaria, August 11; furloughed from division hospital September 10. In hospital this case was diagnosed typhoid fever.

No. 66. Company G: Sent to division hospital without diagnosis August 12. Here the disease was diagnosed enteritis, and the patient was furloughed August 24.

No. 67. Company A: Malaria, August 13; still sick in division hospital August 31.

No. 68. Company K: Malaria, August 14; still sick in division hospital August 31.

No. 69. Band: Malaria, August 15; still sick in division hospital August 31.

No. 70. Company M: Malaria, August 16; still sick in division hospital August 31.

No. 71. Company F: Diarrhea, August 16; still sick in division hospital August 31.

No. 72. Company G: Malaria, August 18; still sick in division hospital August 31.

No. 73. Company E: Malaria, August 18; still sick in division hospital August 31.

No. 74. Company C: Malaria, August 18; still sick in division hospital August 31.

No. 75. Company L: Malaria, August 18; still sick in division hospital August 31.

No. 76. Company E: Sent to Sternberg Hospital without diagnosis, August 20. Here the disease was diagnosed malaria, and the patient was furloughed August 26.

No. 77. Company A: Diarrhea, August 21; still sick August 31.

No. 78. Company C: Malaria, August 21; sent to division hospital August 25.

No. 79. Company K: Malaria, August 21; sent to division hospital August 25.

No. 80. Company G: Malaria, August 21; sent to division hospital August 25.

No. 81. Company D: Malaria, August 21; sent to division hospital August 25.

No. 82. Company D: Malaria, August 21; sent to division hospital August 25.

No. 83. Company C: Malaria, August 21; sent to division hospital August 25.

No. 84. Company M: Dysentery, August 21; sent to division hospital August 27.

No. 85. Company I: Diarrhea, August 21; sent to division hospital August 25.

C.—At Knoxville, Tenn.

No. 86. Company M: Malaria, August 25; died in division hospital October 3.

No. 87. Company D: Sent to division hospital without diagnosis August 26. Here the disease was diagnosed typhoid fever and the patient died September 22.

No. 88. Company D: Sent to division hospital without diagnosis August 26. Here the disease was diagnosed typhoid fever and the patient was furloughed September 22.

No. 89. Company F: Malaria, August 27; still sick in division hospital August 31.

No. 90. Company H: Malaria, August 27; still sick in division hospital in September.

No. 91. Company I: Sent to division hospital without diagnosis August 29. Here the disease was diagnosed typhoid fever and the patient was furloughed September 30.

No. 92. Company D: Malaria, August 30; furloughed from division hospital September 21. In hospital this case was diagnosed typhoid fever.

No. 93. Company L: Malaria, August 30; sick in division hospital in September.

No. 94. Company F: Malaria, August 30; sick in division hospital in September. In hospital this case was diagnosed typhoid fever.

No. 95. Company M: Sent to division hospital without diagnosis August 31. Here the disease was diagnosed enteric fever and the patient was furloughed September 21.

No. 96. Company D: Diarrhea, September 1; sent to division hospital September 2. In hospital this case was diagnosed typhoid fever.

No. 97. Company F: Malaria, September 1; still sick in division hospital September 30.

No. 98. Band: Diarrhea, September 3; still sick in division hospital September 30.

No. 99. Company D: Sent to division hospital without diagnosis September 5. Here the disease was diagnosed typhoid fever, and the patient died September 24.

No. 100. Company D: Malaria, September 9; sent to division hospital September 30.

No. 101. Company K: Malaria, September 9; still sick September 30.

No. 102. Company K: Malaria, September 9; sent to division hospital September 21, and transferred to City Hospital October 1. In hospital this case was diagnosed typhoid fever.

No. 103. Company D: Sent to division hospital without diagnosis, September 10. Here the disease was diagnosed typhoid fever and the patient was furloughed September 16.

No. 104. Company F: Malaria, September 10; sent to division hospital September 30.

No. 105. Company E: Malaria, September 10; still sick in division hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 106. Company F: Malaria, September 10; still sick in division hospital September 30.

No. 107. Company I: Diarrhea, September 10; still sick in division hospital September 30.

No. 108. Company K: Malaria, September 10; still sick in division hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 109. Company F: Indigestion, September 12; still sick in division hospital September 30.

No. 110. Company B: Gastritis, September 12; still sick in division hospital September 30.

No. 111. Company L: Malaria, September 12; sent to division hospital September 24.

No. 112. Company F: Malaria, September 15; still sick in division hospital September 30.

No. 113. Company D: Sent to division hospital without diagnosis September 16. Here the disease was diagnosed typhoid fever; further disposition of the patient is not given.

No. 114. Company I: Sent to division hospital without diagnosis September 17. Here the disease was diagnosed typhoid fever; further disposition is not given.

No. 115. Company K: Typhoid fever, September 23; sent to division hospital September 30 and transferred to City Hospital October 4.

No. 116. Company A: Sent to division hospital without diagnosis September 23. Here the disease was diagnosed remittent malaria, and the patient was returned to duty November 13.

No. 117. Company not given: Malaria, September 23; furloughed October 4.

No. 118. Company M: Malaria, September 23; furloughed October 4.

No. 119. Company D: Malaria, September 27; furloughed October 4.

No. 120. Company not given: Sent to hospital without diagnosis October 19. Here the disease was diagnosed malaria and the patient was still sick October 31.

SUMMARY.

Assembled at Camp Northern, Griffin, Ga., in May, 1898.	
Mustered into United States service in May, 1898.	
Arrived at Chickamauga Park June 17, 1898.	
Mean strength on arrival, 1,121.	
Date of first case of probable typhoid fever, June 6, 1898.	
Date of first case of recognized typhoid fever, June 6, 1898.	
Left Chickamauga Park August 21, 1898.	
Strength on departure, 1,212.	
Number of cases of probable typhoid fever developed at Chickamauga, and before reaching this place	85
Number of cases of probable typhoid fever developed at Knoxville:	
From August 22 to 31	10
During September	25
Total number of cases of probable typhoid fever developed in the First Georgia Volunteer Infantry from May to September 30, 1898	120
These 120 cases were diagnosed as follows:	
Typhoid fever	36
Enteric fever	1
Malaria	64
Diarrhea	10
Dysentery	4
Enteritis	3
Gastritis	1
Indigestion	1
Total	120

This regiment developed typhoid fever in its State encampment and had seven probable cases before it reached Chickamauga. We will compare the history of this regiment with that of the Thirty-first Michigan, because they were brigaded together at Chickamauga

and at Knoxville. It can not be said that either of these regiments infected the other with typhoid fever, because the Georgia regiment had developed typhoid fever before it went to Chickamauga, and the Michigan regiment had developed typhoid fever at Chickamauga before the arrival of the Georgia regiment. The number of cases developed in each of these regiments up to September 30 is, as shown by the records, as follows:

In the Michigan regiment	188
In the Georgia regiment	120

These figures apparently show that the Michigan regiment was much more widely infected, but this difference is probably more apparent than real, because many of the cases in the Michigan regiment would not be classed among the probable typhoids had they not remained under observation during October. In other words, the fact that we have no report, or no satisfactory report, from a given command during the month of October often leaves us in doubt concerning the nature of many cases the initial date of which fell in September.

Both of these organizations maintained regimental hospitals which at the time of our inspection were not in commendable shape. It is true, however, that they were in no worse condition than the division hospital was at the same time.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bates, William	Pvt., A	1898, Sept. 7	Knoxville, Tenn.	Hemorrhage, typhoid.
Benton, Henry G.	Pvt., G	Aug. 25	United States General Hospital, Fort McPherson, Ga.	Typhoid.
Bowen, James O.	Pvt., D	Sept. 5	Chickamauga, Ga.	Do.
Buford, Wm.	Pvt., M	Oct. 3	Division hospital.	Do.
Burton, Henry J.	Pvt., G	Aug. 25	Fort McPherson, Ga.	Do.
Chilson, Charles M.	Pvt., K	Sept. 13	Savannah, Ga.	Inflammation of the bowels.
Davis, Andrew M.	Pvt., G	July 26	Leiter Hospital, Ga.	Typhoid.
Devore, Elbert S.	Pvt., F	Aug. 8	Chickamauga, Ga.	Fever.
Shelter, Charles E.	Pvt., D	Sept. 24	Knoxville, Tenn.	Typhoid.
Youles, James M.	Pvt., G	July 21	Leiter Hospital, Ga.	Do.
Total deaths				10
Deaths due to typhoid fever				9
Percentage of deaths among probable cases of typhoid fever (120). 7.5.				
Percentage of deaths among recognized cases of typhoid fever (36). 25				

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST GEORGIA VOLUNTEER INFANTRY.

Medical officers.

James I. Garrard, major and surgeon, Macon, Ga.
William J. Little, lieutenant and assistant surgeon, Sparta, Ga.
Joseph G. Jarrell, lieutenant and assistant surgeon, Savannah, Ga.

Lieutenant Jarrell states:

The First Georgia Regiment, United States Volunteers, was mustered in at Griffin, Ga., the site of the State encampment, where every convenience in the way of bath houses, kitchens, and privies were at the disposal of the troops. The water was supplied from the city water works, being obtained from a large spring near the encampment. The men were all carefully examined, and, as well as I remember, we had no typhoid fever in the First Georgia

until after we went to Chickamauga Park. We had diarrhea and dysentery, but I think that these were due mostly to improper cooking.

At Camp Thomas our camp was very well located, with fair drainage, but a little too shady. The drinking water was obtained from a large spring on the Ringold road about 4 miles from the camp. No water main was near our camp, but there were two wells, one used by a Pennsylvania regiment and one located at the junction of the Brotherton and Reed roads. Both wells, I think, contained good water. Water was sometimes obtained from these wells. The company sinks were located at the foot of each street and they, as well as the whole camp, were kept well policed. The excrement was covered with dry earth. Col. A. R. Lawton gave his personal attention to the inspection of the camp. At Camp Thomas we had a number of cases of malarial fever soon after our arrival. This was natural, our boys coming mostly from the lower counties of the State. I was transferred to the Reserve Ambulance Corps about July 12 and did not rejoin my regiment until my return from Porto Rico for the purpose of being mustered out of service. Doctor Garrard, of Macon, Ga., the major and surgeon, can give you the balance of the record.

Before leaving Camp Thomas I knew there would be much sickness from the carelessness of the troops and the way they were depositing their excrement broadcast over the land, and the careless way in which the sinks were managed in almost every regiment and at the hospitals. The water supply I considered excellent, and, for myself, all the water I drank came from Chickamauga Creek. Dr. Lawrence Smith, of the reserve hospital, drank nothing but boiled water, but died with typhoid fever soon after our arrival in Porto Rico.

In Porto Rico there was no typhoid fever when we arrived, except what had broken out on the transports during the voyage. It was called malarial fever, and no care or caution was exercised. At Guayamo, P. R., the camp of the Fourth Ohio Regiment was splendidly located on a hill where a most excellent water supply was obtainable. The camp was kept in good condition. Typhoid fever broke out in the regiment and they had a number of cases. It was called malarial fever. I succeeded in convincing some of the surgeons that we were having typhoid fever. I was in charge of the typhoid ward of the hospital, which had been located in the city itself. The medical inspector several times reported cases as "malarial fever" to the authorities, having changed my diagnosis. In several instances I had the unpleasant pleasure of verifying my diagnoses by autopsies. I disposed of all fecal matter and urine by burning them in a crematory that I had erected in the yard of the hospital, and had the good luck of having only one case among my attendants. The Third Illinois Regiment had a good location for their camp, but it was soon the dirtiest and filthiest camp I have ever seen. Most of the sickness came from that regiment, and nearly all the typhoid fever. The Signal Corps was located south of the city near the cane fields, the least desirable camp site of them all, but the camp was kept clean and healthful. They had little sickness. The reserve hospital was located on a hill east of Guayamo. The water was obtained from the waterworks. The fecal matter was thrown into sinks without being disinfected. Flies swarmed everywhere. I urged the building of a crematory, but it was not done. A number of the attendants had typhoid fever.

I do not think in a single case the water supply carried the infection. The spread of the disease was due to the careless disposition of filth, and the flies were the means of dissemination, swarming from the sinks to the kitchens. A mistake was made in many cases. Owing to the absence of certain symptoms, many of the surgeons diagnosed typhoid fever as malarial fever. I would always advise the isolation of typhoid-fever cases and thorough disinfection of everything. The location of the camp had nothing to do with the spread of the disease, for every site chosen was soon changed by the soldiers into a filthy place.

Major Garrard has sent us a communication, which, however, contains no additional information of value. He thinks that we have greatly overestimated the number of cases of typhoid fever in his regiment. In one point he differs from Lieutenant Jarrell, and in this Major Garrard is certainly right. The Major states that typhoid fever did appear in this regiment at its State encampment. He gives the number of cases of this disease at that place as from five to eight, and it may be seen that we have placed this number at seven.

ONE HUNDRED AND FIFTY-EIGHTH INDIANA VOLUNTEER INFANTRY.

Second Brigade, Second Division, First Army Corps.

The only information in our possession concerning this regiment is that furnished by the monthly sick reports and the records of the Second Division hospital. The first sick report covers the dates May 12 to May 31, inclusive. In this report we find the following statement made by the surgeon in charge:

The health of the command is good. There has been a slight epidemic of measles, but this is now under control. There has been some diarrhea, due, I think, to change of water and to injudicious eating. The general sanitary condition of the camp is good.

CONDENSED SICK REPORT, MAY 12 TO MAY 31, INCLUSIVE.

Mean strength	1,023
Intermittent malaria.....	3
Other diseases.....	15
Total	18

It is an interesting fact that diseases were diagnosed as malaria in this regiment as early as May, while in the other regiments of the same brigade malaria did not occur, according to the sick reports, until much later. This is another evidence that, in fact, there was no malaria in the brigade. The cases of so-called malaria in this report are the only ones of interest to us. Two of these were off duty for only two days. The third case is diagnosed as "tertian intermittent;" and it appears from the report that the patient was left at the City Hospital at Indianapolis and returned to duty June 30. This is the only possible case of typhoid fever in this report. The regiment was under the charge of Capt. Homer I. Jones.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,320
Intermittent malaria.....	5
Remittent malaria.....	3
Acute diarrhea	1
Dysentery	5
Other diseases.....	43
Total	57

In the June report Captain Jones makes the following statement:

The general health of the command continues good. Occasional cases of measles occur. There is also a slight epidemic of diarrhea.

Both of these diseases are more prevalent among recruits. The general sanitary condition of the camp is good.

The only possible cases of typhoid fever so far as the records show during the month of June are the following:

A private of Company C appeared on sick report June 6 under the diagnosis of "acute indigestion." He remained sick in quarters until June 28, when he was transferred to Leiter Hospital. On the records of this hospital his case is diagnosed as "acute enteritis with local peritonitis." He was operated upon for appendicitis on June 30 and died July 1. There is no statement as to whether or not an autopsy was made. After death the diagnosis of acute enteritis was continued.

On June 25 a private of Company G reported with diarrhea. This man remained sick in quarters until July 20. On June 28 a private of Company E reported with malaria. This man remained sick in quarters until August 13, when he was furloughed home.

On the same date a private of Company I reported sick under the diagnosis of typhoid fever. He was sent to Leiter Hospital July 3, and was furloughed August 6.

On the next day, June 29, a private of Company D reported with typhoid fever and was sent to division hospital, where he died August 5.

It will be seen from these facts that typhoid fever had become fairly well established in the regiment at the end of June.

Lieut. Paul J. Barcus was in charge of this regiment when the July report was made. He offers no comments.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,315
Intermittent malaria	7
Remittent malaria	12
Acute diarrhea	2
Typhoid fever	2
Dysentery	7
Enteritis	1
Other diseases	36
Total	67

The two cases of recognized typhoid fever reported in this month are the two individuals already mentioned as having this disease in June.

Of the cases included in the above report, at least seven were probably typhoid fever. These are as follows:

No. 1. Diarrhea, June 25; sent to division hospital; returned to duty July 20.

No. 2. Dysentery, June 24; sent to Fort Thomas. Here the diagnosis was changed to typhoid fever.

No. 3. Remittent malaria, July 3; sent to Fort Thomas, where the disease was diagnosed typhoid fever.

No. 4. Remittent malaria, July 12; returned to duty July 28.

No. 5. Remittent malaria, July 11 to 30.

No. 6. Remittent malaria, July 11 to 31.

No. 7. Remittent malaria, June 28 to September 16.

There were several other cases of typhoid fever during the month of July which do not appear on this report. These are as follows:

No. 1. Malaria, July 14; died September 21.

No. 2. Malaria, July 23; furloughed August 18.

No. 3. Malaria, July 11 to August 19.

No. 4. Malaria, July 14 to August 28.

No. 5. Malaria, July 2 to August 19.

No. 6. Malaria, July 10; sent to Sternberg Hospital August 31. Here the disease was diagnosed as typhoid fever, and the patient was furloughed September 22.

No. 7. Malaria, July 21; furloughed August 8.

No. 8. Malaria, July 11 to September 16.

No. 9. Malaria, July 28; furloughed August 13.

No. 10. Malaria, July 30; sick September 30.

No. 11. Malaria, July 18; furloughed August 7.

It will thus be seen that most of the cases diagnosed as malaria in this regiment in the month of July were actually cases of typhoid fever.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,284
Intermittent malaria	97
Remittent malaria	20
Acute diarrhea	9
Typhoid fever	3
Other diseases	46
Total	175

In a later report 4 of the intermittent malarias and 1 remittent malaria in this report were changed in diagnosis to typhoid fever. This would make the corrected report stand as follows:

Intermittent malaria	93
Remittent malaria	19
Acute diarrhea	9
Typhoid fever	8
Other diseases	46
Total	175

Seventy of the cases designated as malaria, after making the above correction, proved subsequently to be typhoid fever, as shown by hospital reports.

This regiment left Chickamauga Park August 26 and went to Camp Poland, near Knoxville, Tenn. It remained here about two weeks, as will be seen later.

The September report was made by Maj. Fred R. Charlton, who makes the following statement:

The regiment left Knoxville, Tenn., for State camp, Indianapolis, with a view of being mustered out on September 12. The regiment was disbanded on thirty days' furlough September 17. On arrival at Indianapolis the sick were turned over to the State Hospital.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,278
Intermittent malaria	61
Remittent malaria	9
Acute diarrhea	4
Typhoid fever	2
Other diseases	14
Total	90

Nearly all of the malarias reported in September are brought over from July and August. Of the 2 cases of typhoid fever reported, both died. The initial date of one of these was July 14, and that of the other September 6.

We have not thought it profitable to discuss the relationship of the various diseases reported in this regiment. The incompleteness of the report, together with the fact that the regiment was dispersed so early, would render information gained in such a study of doubtful value.

The following is a summary concerning typhoid fever in this regiment:

Total cases tabulated	128
Number with regimental diagnosis of typhoid fever.....	12
Number with regimental diagnosis of malaria	90
Number with regimental diagnosis of diarrhea	2
Number without regimental diagnosis but found on hospital report	24
Total	128

It would be exceedingly interesting if we could follow the members of this regiment, after dispersion to their homes, and ascertain how many of them had typhoid fever.

SUMMARY.

Assembled near Indianapolis Ind., in April, 1898.	
Mustered into United States service May 12, 1898.	
Arrived at Chickamauga Park May 18, 1898.	
Strength on arrival, 1,023.	
Date of first case of probable typhoid fever, June 6, 1898.	
Date of first case of recognized typhoid fever, June 24, 1898.	
Left Chickamauga Park August 25, 1898.	
Strength on departure, 1,288.	
Number of cases of probable typhoid fever developed at Chickamauga	95
Arrived at Knoxville, Tenn., August 26, 1898.	
Left Knoxville September 12, 1898.	
Number of cases of probable typhoid fever developed at Knoxville	33
Total number of cases of probable typhoid fever developed in the One hundred and fifty-eighth Indiana, from May to September 12, 1898	128
These 128 cases were diagnosed as follows:	
Typhoid fever	49
Continued fever	1
Malaria	74
Diarrhea	2
Gastritis	1
Dysentery	1
Total	128

We are left in doubt as to whether or not this regiment carried the typhoid infection with it to Chickamauga. It is quite certain that it became infected quite as widely as any regiment in the brigade while at Chickamauga. Although this command did not leave Knoxville until September 12, 1898, the last cases of fever reported occurred September 6. It is not at all prob-

able that typhoid fever ceased so abruptly and so quickly after the command left Chickamauga. The histories of other regiments of this division render such a supposition altogether untenable. The sudden and premature cessation was undoubtedly in the keeping of the records and not in the occurrence of the disease.

None of the regiments of the Second Brigade of this division changed the location of their camps while at Chickamauga. We may therefore with possible profit compare the records of the One hundred and fifty-eighth Indiana with those of the First Georgia, in order to ascertain whether or not the latter improved its condition or lessened the number of cases of typhoid fever by changing its site at Chickamauga. The first camp at Chickamauga of the First Georgia and the camp of the One hundred and fifty-eighth Indiana were immediately adjacent. The second camp of the First Georgia was some distance away and quite isolated from any other command. From one point of view the disadvantage, in making such a comparison as this proposed, was with the Georgia regiment, which went to Chickamauga quite widely infected with typhoid fever, while the One hundred and fifty-eighth Indiana had not developed a recognized case of typhoid fever up to the time of the arrival of the First Georgia. From another point of view the disadvantage would be with the Indiana regiment, because it had already occupied its camp site for one week when the Georgia regiment arrived. For these reasons it must be admitted that conclusions drawn from such a comparison must not be considered as very convincing. However, we can state the facts without placing too much stress upon the conclusions. The One hundred and fifty-eighth Indiana occupied one site at Chickamauga from May 18 to August 25, and developed 128 cases of probable typhoid fever up to September 12, 1898; while the First Georgia remained at Chickamauga from June 17 to August 21, dividing this time about equally between two camp sites, and developed 120 cases of probable typhoid fever up to September 30, 1898. If we are to draw any conclusions from these data it must be admitted that the Georgia regiment acted wisely when it changed its location at Chickamauga.

Let us pursue this question further and carry out a similar comparison between two other regiments in these two brigades. The Thirty-first Michigan of the First Brigade and the Sixth Ohio of the Second Brigade were on adjacent encampments during May, June, and the greater part of July at Chickamauga. Both of these regiments undoubtedly came onto the ground infected with typhoid fever. The Ohio regiment retained its original site during its entire stay at Chickamauga, and developed up to September 30, 1898, 291 cases of probable typhoid fever. The Michigan regiment changed its location at Chickamauga the last of July or the first of August, and developed up to September 30,

1898, 239 cases of probable typhoid fever. Both of these commands reached Chickamauga practically the same day, left Chickamauga within the same week, and took up encampments not far removed from one another at Knoxville, Tenn. Again, if it be permissible to draw any conclusions from these data, it must be claimed that the Michigan regiment was benefited by changing its camp site at Chickamauga.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Allis, Newton D.....	Pvt., B	1898, Oct. 29	Athens, Ind.....	Typhoid.
Boothroyd, Louis G....	Mus., G	Sept. 19	Camp Mount, Indianapolis, Ind.	Typhoid, with perforation of bowel and peritonitis as a complication.
Britton, Benjamin F..	Pvt., M	Aug. 17	Camp Thomas, Ga....	Typhoid.
Jennings, Ashley.....	Pvt., C	July 1	Lester Hospital, Ga....	Acute enteritis, local peritonitis.
Keir, William H.....	2d Lt., B	Aug. 8	St. Petersburg, Fla...	Typhoid malaria.
McMullen, Harry A...	Pvt., D	Aug. 5	Camp Thomas, Ga....	Typhoid.
Mitchell, Harry.....	Pvt., M	Oct. 10	Camp Mount, Indianapolis, Ind.	Do.
Moon, John A.....	Pvt., L	Oct. 20	do.....	Do.
Richie, W.....	(?)	Aug. —	do.....	Do.
Rosberg, Victor G.....	Corpl., A	Sept. 30	At home.....	Do.
Stevens, Ira W.....	Pvt., B	Sept. 2	Chickamauga, Ga....	Do.
Wiley, Clarence C.....	Pvt., D	Sept. 17	Camp Mount, Indianapolis, Ind.	Pneumonia.

Total deaths.....	12
Deaths due to typhoid fever.....	10
Percentage of deaths among cases of probable typhoid fever (128), 7.81.	
Percentage of deaths among cases of recognized typhoid fever (49), 20.4.	

COMMUNICATIONS FROM THE SURGEONS OF THE ONE HUNDRED AND FIFTY-EIGHTH INDIANA VOLUNTEER INFANTRY.

Medical officers.

Frederick R. Charlton, major and surgeon, Indianapolis, Ind.
Homer I. Jones, captain and assistant surgeon, Indianapolis, Ind.
Paul J. Barcus, first lieutenant and assistant surgeon, Crawfordsville, Ind.

Under date of July 20, 1899, Captain Jones furnished us with the following information:

Our location at Chickamauga was in a small grove at the east of the park and our colonel was ordered to make the distance between companies' and officers' tents very short, as it was necessary to put two regiments in between it and the eastern end of the park. We were forced to contract our lines to half the regulation distances between companies and regiments. The Sixth Ohio Volunteer Infantry had its line only about 30 feet from ours, and the sinks of this regiment and the kitchens of the First West Virginia were only 12 or 15 feet apart. There were two or three wells within our lines, but the large demand for water soon exhausted them. After this we obtained water, first from Crawfish Spring and a little later from Blue Spring. Our sinks could not be dug deeper than 18 or 20 inches. The ground was impervious and liquid excretions soon filled these shallow sinks. Attempts to add dry earth were futile, because the dry clay did not absorb the moisture, and when it was thrown into the sinks the contents overflowed. Moreover, when it rained the sinks frequently overflowed and polluted the soil for some distance about them.

In my judgment the causes of typhoid fever among the troops were:

First. The condition of sinks, of which I have already spoken.

Second. The drinking of water which had not been boiled, and especially the drinking of water from the shallow wells.

Third. I believe that the flies carried the infection from the sinks to the kitchens and mess tents.

Fourth. The troops were crowded too closely together.

Fifth. Regimental camp sites should have been frequently changed.

Sixth. The food was improperly prepared and was not appetizing and easily digested. It frequently acted as an irritant and prepared the body for the reception of the typhoid germ.

Seventh. The men ate all manner of food obtained from hucksters.

Major Charlton submits the following statement:

(1) The regiment reached Chickamauga without adequate medical supplies, nearly everything except the field case having been held by Governor Mount as State property, and this was granted us only upon urgent request.

(2) In my opinion very many cases of mild typhoid fever passed under the diagnoses of dysentery, diarrhea, malaria, enteritis, etc.

(3) In my opinion there was very little typical malaria in Chickamauga. I am able to recall only a few cases that I should have diagnosed malaria. There were many cases of somewhat indefinite type, showing malarial tongue and bilious symptoms, with periodical headache and slight fever.

(4) Very many developed typhoid fever after the regiment was mustered out and were treated in their homes.

(5) The change from Chickamauga to Knoxville was so grateful to everyone that I suspect that the mental uplift was such as to lead many men not to report themselves sick until it was absolutely necessary.

SIXTH OHIO VOLUNTEER INFANTRY.

Second Brigade, Second Division, First Army Corps.

The call to which this regiment responded was issued April 20, 1898. The command assembled at Toledo, Ohio, April 25. Four days later it went to Columbus, Ohio. It was mustered into the United States service May 12, and remained at Columbus from April 29 to May 17. While here it was supplied with city water and used sinks for the reception of fecal matter.

According to the testimony of Capt. J. D. Howe, made to our board in September, at Knoxville, Tenn., most of the sickness at Columbus consisted of "bronchial coughs and colds."

May 17 this regiment left Columbus, Ohio, and the next day it reached Chickamauga Park, Ga. Here it was brigaded with the First West Virginia and the One hundred and fifty-eighth Indiana.

The regimental camp was located in the woods on a sloping knoll, and was fairly well drained except on one flank. During the first days of its stay at Chickamauga water was obtained from Jays Mill well. Later all the drinking water was brought in barrels from Blue Spring. This brigade was in camp nearly 2 miles distant from any of the pipes carrying Chickamauga Creek water. The company sinks were located about 125 feet to the rear of the mess tents. Colonel McMakin stated to us that

orders were issued instructing that the company sinks should be dug to a depth of 6 feet and that the contents should be covered with earth not less than twice a day. However, the rocky nature of the soil rendered it quite impossible to dig the pits to the depth specified in the order. Several officers testified that both the company and kitchen sinks soon became exceedingly foul and that their contents were filled with maggots.

This command occupied one site during its stay at Chickamauga. Each tent stood in exactly the same place during the whole of this time. The regiment left Chickamauga August 27 and proceeded to Knoxville, Tenn.

In the sick report for May A. L. Osborne, surgeon in charge, makes the following statement:

The medical condition of the command is good. There has been an epidemic of measles, and the patients have been placed in quarantine and carefully treated.

CONDENSED SICK REPORT FOR MAY.

Mean strength	864
Typhoid fever	1
Other diseases	18
Total	19

It should be understood that under the head of "other diseases," we include those accidents and diseases which have no relation to typhoid fever.

The June report was made by Capt. John B. Howe. In this he offers no comments.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	894
Malaria	3
Diarrhea	2
Gastric disorders	3
Indigestion	3
Other diseases	18
Total	29

The report for July was also made by Captain Howe, and contains no special remarks.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,319
Malaria	11
Diarrhea	14
Indigestion	15
Gastric disorders	4
Other diseases	16
Total	60

In the cases reported Captain Howe makes the following statement:

This command was in camp at Camp George H. Thomas from May 19, 1898, to August 27, 1898. On the latter date the command departed for Camp Poland, Knoxville, Tenn., arriving August 29. Since our arrival at this camp about 20 cases of mild malarial remittent fever have developed, which were contracted at Camp Thomas. With the exception of these cases the medical condition of the camp is excellent, there being no other diseases of serious nature.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,323
Typhoid fever	1
Malaria	103
Diarrhea	100
Indigestion	62
Gastric disorders	9
Dysentery	1
Other diseases	41
Total	317

In the September report Captain Howe adds:

The health of the command is improving, there being no diseases of a serious nature prevalent. Most of the sickness are cases of a minor nature, which do not call for report or comment.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,293
Typhoid fever	1
Malaria	203
Indigestion	127
Diarrhea	87
Gastric disorders	19
Dysentery	1
Other diseases	102
Total	540

In the October report Acting Asst. Surg. J. B. Alcorn makes the following statement:

The health of the command is improving. The prevailing disease that has caused the sickness we have had is typhoid fever. The measures adopted for its prevention have been isolation of all cases and the perfect sanitary condition of the command. The daily report at sick call is composed of minor cases that need no comment.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,276
Typhoid fever	1
Malaria	205
Indigestion	71
Diarrhea	18
Gastric disorders	10
Dysentery	8
Other diseases	66
Total	379

Only two cases were recognized as typhoid fever by the regimental surgeon during the whole of the time covered by the above-mentioned reports. The first of these was sick on May 18 when the regiment reached Chickamauga. This man was kept in the regimental hospital, where he died May 24.

The second case of recognized typhoid fever was detected when the regiment reached Knoxville, August 29. This man was carried on the sick reports for August, September, and October, and was still sick when the last report was made.

Our knowledge of this regiment closes with the October report, with the exception of a few cases found admitted to hospital in November.

The number of individuals who are recorded as hav-

ing suffered from malaria amount to 273. Some of these occurred on the sick reports for two or three months. This explains why this number does not agree with the sum of the reported cases in the different months. By referring back to the condensed sick reports it will be found the diseases diagnosed as malaria first occurred in June, and upon the different sick reports the following figures appear:

June	3
July.....	11
August	103
September.....	203
October.....	205
Total	525

These figures indicate 525 cases of malaria, but as stated above this large number is due to repetition; and there were only 273 individuals whose diseases were diagnosed as malaria. These are distributed among the different companies as follow:

Company A.....	22	Company I.....	18
Company B.....	25	Company K.....	25
Company C.....	21	Company L.....	30
Company D.....	22	Company M.....	27
Company E.....	24	Staff	5
Company F.....	18		
Company G.....	18	Total.....	273
Company H.....	18		

Of the 273 individuals said to have had malaria, 66 were sick only a few days, and their diseases would have been more properly designated as febriculæ. Most of the others were sick for one month or longer, and were undoubtedly cases of typhoid fever.

Of the 207 cases of protracted malaria or "continued malarial fever," 148 were still sick when the last report was made, October 31, 1898. This leaves 59 completed cases of malaria, among which there are reported 12 deaths. A death rate of more than 20 per cent in "mild remittent malarial fever" is, to say the least, unexpectedly high.

Of the 207 cases of "continued malarial fever" (typhoid fever diagnosed as malaria), 156 appear for the first time on sick report when they became ill with typhoid fever; in other words, 156 of the cases of typhoid fever were not preceded by any indisposition—at least so far as the records show.

Those individuals who had typhoid fever and whose names had previously appeared on sick report afford material for some interesting studies. Indeed, we regard this of sufficient importance to justify us in giving a complete list of the cases of "continued malaria," which was preceded by some other illness:

No. 1. Indigestion, August 24 to 25; malaria, August 31 to October 8.

No. 2. Diarrhea, August 16 to 17; malaria, September 20 to October 8.

No. 3. Indigestion, September 11 to 13; malaria, September 24; died October 8.

No. 4. Diarrhea, September 5 to 6; malaria, September 10; still sick October 31.

No. 5. Indigestion, September 4 to 8; indigestion, September 15 to 16; malaria, September 20; still sick October 31.

No. 6. Diarrhea, August 14 to 15; malaria, August 18 to October 19.

No. 7. Continued fever, September 7 to 9; malaria, September 10 to 11; continued fever, September 26; still sick October 31.

No. 8. Continued fever, August 12 to 16; malaria, August 19 to September 21.

No. 9. Diarrhea, August 22 to 23; malaria, August 25 to October 25.

No. 10. Diarrhea, August 13 to 16; malaria, August 18; still sick October 31.

No. 11. Indigestion, September 15 to 16; continued fever, September 24; still sick October 31.

No. 12. Diarrhea, August 12 to 13; malaria, August 19 to September 21.

No. 13. Indigestion, August 5 to 6; malaria, August 18 to October 28.

No. 14. Diarrhea, September 13 to 14; indigestion, October 14 to 16; continued fever, October 18; still sick October 31.

No. 15. Indigestion, August 16 to 17; malaria, August 17 to September 23.

No. 16. Diarrhea, August 14 to 16; malaria, August 18 to September 21.

No. 17. Diarrhea, September 6 to 7; malaria, September 12; died September 22.

No. 18. Indigestion, August 22 to 27; malaria, August 29; still sick October 31.

No. 19. Diarrhea, September 2 to 3; malaria, September 5; still sick October 31.

No. 20. Remittent malaria, September 6 to 8; continued fever, September 10; still sick October 31.

No. 21. Indigestion, September 9 to 11; malaria, September 14; still sick October 31.

No. 22. Diarrhea, September 14 to 16; continued fever, September 19; still sick October 31.

No. 23. Diarrhea, August 20 to 21; malaria, August 29 to September 1; malaria, September 2 to 3; malaria, September 5 to 6; continued fever, September 29; still sick October 31.

No. 24. Diarrhea, September 21 to 22; indigestion, September 30 to October 3; continued fever, October 6; still sick October 31.

No. 25. Diarrhea, August 8 to 9; diarrhea, August 13 to 14; malaria, August 20 to October 31.

No. 26. Indigestion, August 19 to 21; continued fever, August 29 to October 24.

No. 27. Diarrhea, August 4 to 5; diarrhea, August 7 to 8; malaria, August 19; still sick October 31.

No. 28. Diarrhea, September 12 to 14; malaria, September 15 to 17; continued fever, September 19; still sick October 31.

No. 29. Indigestion, September 15 to 16; continued fever, September 25; still sick October 31.

No. 30. Simple fever, July 14 to 22; diarrhea, August 2 to 3; continued fever, October 21; still sick October 31.

No. 31. Malaria, August 13 to 14; malaria, August 19 to September 21.

No. 32. Indigestion, August 21 to 22; malaria, August 29; still sick October 31.

No. 33. Simple fever, August 9 to 21; malaria, August 26 to September 30.

No. 34. Diarrhea, August 21 to 22; continued fever, August 29 to September 24.

No. 35. Diarrhea, August 13 to 14; malaria, August 29 to September 25.

No. 36. Diarrhea, August 14 to 15; diarrhea, August 17 to 18; malaria, August 29; still sick October 31.

No. 37. Simple fever, August 12 to 15; diarrhea, August 20 to 24; malaria, August 29; still sick October 31.

No. 38. Malaria, September 10 to 11; indigestion, September 14 to 16; malaria, September 16; still sick October 31.

No. 39. Indigestion, September 10 to 11; malaria, September 12; still sick October 31.

No. 40. Diarrhea, September 10 to 12; continued fever, September 14; still sick October 31.

No. 41. Indigestion, September 11 to 13; indigestion, September 14 to 15; malaria, September 16; still sick October 31.

No. 42. Malaria, September 16 to 18; continued fever, September 23; still sick October 31.

No. 43. Indigestion, October 7 to 12; continued fever, October 18; still sick October 31.

No. 44. Diarrhea, August 13 to 14; malaria, August 29 to October 25.

No. 45. Indigestion, August 4 to 5; malaria, September 13; still sick October 31.

No. 46. Indigestion, September 29 to October 1; continued fever, October 8; still sick October 31.

No. 47. Indigestion, September 11 to 12; malaria, October 15; still sick October 31.

No. 48. Indigestion, August 27 to 29; continued fever, September 29 to October 6.

No. 49. Indigestion, August 2 to 3; malaria, August 18; still sick October 31.

No. 50. Indigestion, September 16 to 17; continued fever, September 20; still sick October 31.

No. 51. Diarrhea, September 21 to 22; continued fever, September 29; still sick October 31.

In our opinion the preceding disease was really a part of the typhoid fever in all of these cases, with the exception of Nos. 2, 14, 23, 30, 45, 47, and 48. Therefore, we think that with the exception of these cases, all others should be included in the list of those who do not appear on sick report until they developed typhoid fever.

We may make the following summary concerning malaria in this regiment:

(1) Two hundred and seventy-three individuals were reported with malaria. Sixty-six of these were cases of some mild indisposition, and would have been more properly designated as febriculæ. Two hundred and seven were undoubtedly cases of typhoid fever.

(2) Of the 207 cases of typhoid fever diagnosed as "continued malaria," 156 first appeared on sick report when attacked by this disease. Forty-four other cases were so closely preceded by some indisposition that such preliminary indisposition must, in our opinion, be regarded as a part of the typhoid fever. Looking at it in this way, we may say that out of 207 of the cases of typhoid fever diagnosed as malaria, 200 were not preceded by any other illness.

The reported "diarrheas" for the entire period from May 18 to October 31 are distributed among the companies as follows:

Company A.....	9	Company H.....	17
Company B.....	16	Company I.....	21
Company C.....	11	Company K.....	10
Company D.....	16	Company L.....	9
Company E.....	25	Company M.....	12
Company F.....	14		
Company G.....	23	Total.....	183

Of these 183 cases of diarrhea, 9 present a subsequent history of such a character as to justify us in believing that they were cases of typhoid fever. There is no

hospital record concerning 7 of these protracted diarrheas. In one case the diagnosis of chronic diarrhea is continued on the hospital register, and in the ninth case the diagnosis was changed in the hospital to typhoid fever. Deducting these 9 cases, there remain 174 cases of diarrhea on the regimental report. Five individuals were reported as having had three attacks, and 15 as having had two attacks of diarrhea. This reduces the number of individuals reported with diarrhea to 149.

It may be of interest to endeavor to ascertain if there be any relation between the diarrheas and the long-continued malarial fevers. With this in view, we will give a list of those names found to have had both diarrhea and protracted malaria.

No. 1. Diarrhea, September 5 to 6; malaria, September 10; still sick October 31.

No. 2. Diarrhea, August 14 to 15; malaria, August 18 to October 19.

No. 3. Diarrhea, August 13 to 16; malaria, August 18; still sick October 31.

No. 4. Diarrhea, August 12 to 16; malaria, August 19 to September 21.

No. 5. Diarrhea, August 20 to 21; malaria, October 2; still sick October 31.

No. 6. Diarrhea, September 13 to 14; malaria, October 18; still sick October 31.

No. 7. Diarrhea, August 14 to 15; malaria, August 18 to September 21.

No. 8. Diarrhea, August 20 to 21; malaria, August 29; still sick October 31.

No. 9. Diarrhea, September 2 to 3; malaria, September 5; still sick October 31.

No. 10. Diarrhea, September 14 to 16; malaria, September 19; still sick October 31.

No. 11. Diarrhea, September 21 to 22; malaria, October 6; still sick October 31.

No. 12. Diarrhea, August 4 to 5; diarrhea, August 7 to 8; malaria, August 19; still sick October 31.

No. 13. Diarrhea, August 8 to 9; diarrhea, August 13 to 14; malaria, August 20 to October 21.

No. 14. Diarrhea, August 17 to 18; malaria, August 29 to September 24.

No. 15. Diarrhea, August 14 to 15; diarrhea, August 17 to 18; malaria, August 29; still sick October 31.

No. 16. Simple fever, August 12 to 15; diarrhea, August 20 to 24; malaria, August 29; still sick October 31.

No. 17. Diarrhea, August 13 to 14; malaria, August 29 to October 25.

These are the only cases of diarrhea that were followed by the so-called "continued malarial fever." We are strongly of the opinion that all of these were real cases of typhoid fever, and that in the majority of them the preliminary diarrhea was a part of the typhoidal process. This is not supposed to be possible in cases Nos. 5 and 6. It is believed to be probable in Nos. 11, 12, 13, 14, 15, and 17, and quite certain in all others. If this supposition be correct, may it not be possible that many of the short diarrheas were due to typhoid infection and that the bacilli in these failed to multiply sufficiently to produce a fully developed form of typhoid fever, and that the disease in this aborted form may give immunity to typhoid fever for

a short period? We will return to these questions after having collected more data bearing on them.

Deducting the 17 individuals mentioned above from the total of 149 who had diarrhea, there remain 132 persons reported with diarrhea, none of whom subsequently had typhoid fever or any other form of continued fever.

We may make the following summary concerning diarrhea in this regiment:

(1) Of the 183 cases reported, 9 were probably cases of typhoid fever. In the remaining 174 cases 149 individuals were involved. Of these 149 individuals, 17 subsequently developed typhoid fever; and in 15 of these cases the typhoid fever followed so closely upon the diarrhea that the latter is believed to have been a part of the former.

(2) Of the 149 individuals who had diarrhea, 132 had subsequently neither typhoid fever nor any other form of "continued fever."

We now turn to the cases diagnosed as "indigestion." These are distributed among the companies as follows:

Company A	25	Company H	15
Company B	10	Company I	14
Company C	10	Company K	21
Company D	12	Company L	15
Company E	12	Company M	20
Company F	18		
Company G	18	Total	190

Of these 190 cases, 24 were of such a duration as to lead us to believe that they were really cases of typhoid fever. These cases are as follows:

- No. 1. Indigestion, August 29; still sick October 23.
- No. 2. Indigestion, August 3 to October 25.
- No. 3. Indigestion, September 15; furloughed September 26.
- No. 4. Indigestion, June 26; sent to division hospital July 2. Here the disease was diagnosed as typhoid fever, and the man was furloughed July 27.
- No. 5. Indigestion, August 29 to October 23.
- No. 6. Indigestion, August 26; sent to Sternberg Hospital on the same date. Here the disease was diagnosed as typhoid fever. This patient was still sick October 31.
- No. 7. Indigestion, September 8; sent to division hospital on same date. Here the disease was diagnosed as typhoid fever and the patient furloughed September 26.
- No. 8. Indigestion, June 23 to September 12.
- No. 9. Indigestion, August 29 to September 25.
- No. 10. Indigestion, August 29 to September 26.
- No. 11. Indigestion, August 29 to September 25.
- No. 12. Indigestion, September 3; still sick October 31.
- No. 13. Indigestion, September 8; sent to division hospital on the same date. Here the disease was diagnosed as typhoid fever, and the patient was furloughed November 8.
- No. 14. Indigestion, July 6; sent to division hospital July 13. Here the disease was diagnosed as typhoid fever, and the name does not appear on any of the subsequent sick reports.
- No. 15. Indigestion, August 29 to September 25.
- No. 16. Indigestion, August 24; sent to division hospital August 26. Here the case was diagnosed as typhoid fever, and the patient died August 30.
- No. 17. Indigestion, August 29 to September 25.
- No. 18. Indigestion, August 29 to October 25.
- No. 19. Indigestion, August 31; still sick October 31.
- No. 20. Indigestion, August 29; still sick October 31.

- No. 21. Indigestion, August 29 to September 25.
- No. 22. Indigestion, August 29; still sick October 31.
- No. 23. Indigestion, August 29; still sick October 31.
- No. 24. Indigestion, August 29; died September 13.

Of these 24 cases, 9 were still sick when the October report was closed, leaving 13 completed cases. Two of these died, giving a mortality of 15.46 per cent. Even if we supposed that all of the cases left incomplete in the report ended in recovery 2 deaths in 24 cases of typhoid fever is not an exceptionally low mortality.

We will now attempt a study of the relation between the indigestions and the continued malarías by giving a list of those who are recorded as having suffered from both:

- No. 1. Indigestion, August 24 to 25; malaria, August 31 to October 8.
- No. 2. Malaria, August 11 to September 8; indigestion, September 9 to 11.
- No. 3. Indigestion, September 11 to 13; malaria, September 24; died October 2.
- No. 4. Indigestion, September 15 to 16; malaria, September 20; still sick October 31.
- No. 5. Malaria, August 19 to September 21; indigestion, October 2 to 4.
- No. 6. Indigestion, September 10 to 11; malaria, September 26; still sick October 31.
- No. 7. Indigestion, September 15 to 16; malaria, September 24; still sick October 31.
- No. 8. Indigestion, October 15 to 16; malaria, October 18; still sick October 31.
- No. 9. Indigestion, August 16 to 17; malaria, August 17 to September 23.
- No. 10. Indigestion, August 23 to 27; malaria, August 29; still sick October 31.
- No. 11. Indigestion, September 30 to October 6; malaria, October 6; still sick October 31.
- No. 12. Indigestion, August 19 to 24; malaria, August 29 to October 24.
- No. 13. Indigestion, September 15 to 16; malaria, September 25; still sick October 31.
- No. 14. Indigestion, August 17 to 22; malaria, August 22 to September 21.
- No. 15. Indigestion, September 10 to 11; malaria, September 16; still sick October 31.
- No. 16. Indigestion, September 11 to 16; malaria, September 16; still sick October 31.
- No. 17. Indigestion, September 16 to 18; malaria, September 23; still sick October 31.
- No. 18. Indigestion, October 7 to 12; malaria, October 18; still sick October 31.
- No. 19. Indigestion, August 2 to 3; malaria, August 13; still sick October 31.

These cases show that the so-called "indigestions" were frequently a prelude—more rarely a sequel, as in case No. 2—to typhoid fever.

There is another class of indigestions, of which the following is an example:

Indigestion, July 11 to 21; indigestion, July 23 to August 1; indigestion, August 4 to 5; indigestion, August 5 to 6; indigestion, August 7 to 9; indigestion, August 16 to 19.

It will be seen that this man was on the sick report almost continuously from July 11 to August 19. It is

highly probable that this was a case of intermittent typhoid fever. However, we have not included it in our estimate of the number of cases of typhoid fever in the regiment.

In order to gain further information if possible concerning the nature of the disease or diseases designated as "indigestions" in this regiment, we give herewith a list of all cases of indigestion and a statement of the subsequent history of each so far as the records give us information:

- No. 1. Indigestion, June 26 to October 28.
- No. 2. Indigestion, June 26 to September 12.
- No. 3. Indigestion, June 29; duty, July 4; diarrhea, July 14; discharged August 8.
- No. 4. Indigestion, July 6; quarters, July 23; diarrhea, August 13 and 14; malaria, August 17 to 21.
- No. 5. Indigestion, July 10; duty, July 18.
- No. 6. Indigestion, July 10 to 12; indigestion, July 14; furloughed August 23.
- No. 7. Indigestion, July 11; sent to quarters July 22; indigestion, July 23 to August 1; indigestion, August 4 to 6; indigestion, August 7 to 9; indigestion, August 16 to 19; malaria, August 29 to September 25. This man was in division hospital from July 11 to 22. Here his disease was diagnosed as "gastro-enteritis." He was sent to quarters July 22. The next day he reported at sick call and remained on the sick list until August 1, when he was marked "duty." Three days later he appears on the sick list for two days, and then off and on at intervals of a few days until August 29, when he is again recorded as suffering from indigestion, and this time he remained off duty for nearly one month or until September 25.
- No. 8. Indigestion, July 14 to 16.
- No. 9. Indigestion, July 15 to 17; malaria, August 29 to October 23.
- No. 10. Indigestion, July 20 to 22.
- No. 11. Indigestion, July 26 to 28.
- No. 12. Indigestion, July 30 and 31; indigestion, September 6 to 9; indigestion, September 13 to 18.
- No. 13. Indigestion, August 2 and 3.
- No. 14. Indigestion, August 3 to 15; indigestion, August 29 to October 25.
- No. 15. Indigestion, August 4 and 5; malaria, September 13; still sick October 31.
- No. 16. Indigestion, August 5 and 6; malaria, August 18 to October 28. This man was sent to Sternberg Hospital August 20, and there the disease was diagnosed as typhoid fever.
- No. 17. Indigestion, August 5 and 6.
- No. 18. Indigestion, August 14 to 16.
- No. 19. Indigestion, August 15 and 16.
- No. 20. Indigestion, August 16 and 17; malaria, August 17 to September 23.
- No. 21. Indigestion, August 16 to 18.
- No. 22. Indigestion, August 16 to 18.
- No. 23. Indigestion, August 17 to 22; malaria, August 19 to September 21.
- No. 24. Indigestion, August 18 to 20; continued fever, September 7 to 10. This man does not appear on the regimental records again, but from the hospital report we learn that he was sent to division hospital with typhoid fever September 12 and was furloughed October 12.
- No. 25. Indigestion, August 18 to 27; diarrhea, August 29 to September 25; simple fever, August 12 to 15. It will be seen that in this case this man's disease, which in all probability was typhoid fever, had its initial date August 12.
- No. 26. Indigestion, August 18 and 19; diarrhea, September 26 and 27.
- No. 27. Indigestion, August 19 to 21; continued fever, August 29 to September 24.

- No. 28. Indigestion, August 19 to 21; indigestion, August 22 to 24; malaria, August 29 to October 24.
- No. 29. Indigestion, August 20 to 22; malaria, September 19 to 21; malaria, September 22 to October 4.
- No. 30. Indigestion, August 21 and 22; indigestion, August 29 to September 25.
- No. 31. Indigestion, August 21 and 22.
- No. 32. Indigestion, August 23 to 27; malaria, August 29; still sick October 31.
- No. 33. Indigestion, August 23 to 26.
- No. 34. Indigestion, August 24 and 25; malaria, August 31 to October 8.
- No. 35. Indigestion, August 24 and 25; diarrhea, August 21 to 23.
- No. 36. Indigestion, August 24; died August 30.
- No. 37. Indigestion, August 24 and 25; diarrhea, August 22 and 23. This name does not again appear on the regimental record, but in the hospital report it is registered as an admission of October 6, with "intestinal toxæmia." The man was furloughed October 29.
- No. 38. Indigestion, August 24 and 25.
- No. 39. Indigestion, August 25 to 27.
- No. 40. Indigestion, August 25 to 27; malaria, October 7 to 10.
- No. 41. Indigestion, August 25 to 27.
- No. 42. Indigestion, August 26; still sick October 31.
- No. 43. Indigestion, August 27 to 30; malaria, August 18 to 26. It will be seen that this man was sick from August 18 to 30. In all probability this was a mild case of typhoid fever.
- No. 44. Indigestion, August 27 to 30; diarrhea, September 15 and 16.
- No. 45. Indigestion, August 27 to 30; diarrhea, September 5 to 7.
- No. 46. Indigestion, August 27 to 29; malaria, September 21 to October 8.
- No. 47. Indigestion, August 29 to October 24; continued fever, August 12 to 23. It will be seen that this man's illness should date from August 12. Undoubtedly this was a case of typhoid fever.
- No. 48. Indigestion, August 29 to September 25.
- No. 49. Indigestion, August 29 to October 25; continued fever, August 21 to 27. This man's typhoid fever should date from August 21.
- No. 50. Indigestion, August 29 to September 9.
- No. 51. Indigestion, August 29; still sick October 31; diarrhea, August 22 and 23.
- No. 52. Indigestion, August 29 to September 25; diarrhea, August 13 and 14.
- No. 53. Indigestion, August 29; still sick October 31.
- No. 54. Indigestion, August 29; still sick October 31; diarrhea, August 13 to 15.
- No. 55. Indigestion, August 29 to September 26.
- No. 56. Indigestion, August 29; died September 13.
- No. 57. Indigestion, August 29 to September 25.
- No. 58. Indigestion, August 31 to September 4.
- No. 59. Indigestion, August 31; still sick October 31.
- No. 60. Indigestion, September 1 and 2; diarrhea, September 3 and 4.
- No. 61. Indigestion, September 1 to 10; diarrhea, August 14 and 15.
- No. 62. Indigestion, September 2 and 3; malaria, October 5 and 6; malaria, October 19 and 20.
- No. 63. Indigestion, September 2 and 3.
- No. 64. Indigestion, September 3 to 5; diarrhea, September 16 and 17; indigestion, October 20 and 21.
- No. 65. Indigestion, September 3 to 5; diarrhea, September 7 and 8.
- No. 66. Indigestion, September 3 to 6; diarrhea, September 8 and 9; indigestion, September 10 to 12.
- No. 67. Indigestion, September 3 to 5; continued fever, October 26 to 31.
- No. 68. Indigestion, September 4 to 6.

- No. 69. Indigestion, September 4 and 5.
- No. 70. Indigestion, September 4 to 8; indigestion, September 15 and 16. This name does not reappear on the regimental record, but the hospital report shows that he was admitted to the division hospital with "continued malaria," September 20, and was furloughed October 17.
- No. 71. Indigestion, September 5 and 6.
- No. 72. Indigestion, September 6 to 11.
- No. 73. Indigestion, September 7 and 8. This man was sick in the division hospital September 9, where his disease was diagnosed "remittent malaria," and he was furloughed September 24.
- No. 74. Indigestion, September 7 and 8. This man was sent to hospital October 22 with "remittent malaria" and was furloughed November 4.
- No. 75. Indigestion, September 8; still sick October 31.
- No. 76. Indigestion, September 8; still sick October 31.
- No. 77. Indigestion, September 8 to 10.
- No. 78. Indigestion, September 9 to 11; malaria, August 11 to September 8. We infer from this record that this man, in all probability, had typhoid fever extending from August 11 to September 8, and the so-called "indigestion" was a sequel to the typhoid fever.
- No. 79. Indigestion, September 9 to 11; malaria, September 14; still sick October 31.
- No. 80. Indigestion, September 9 and 10.
- No. 81. Indigestion, September 9 to 16.
- No. 82. Indigestion, September 10 to 12; indigestion, September 15 and 16.
- No. 83. Indigestion, September 10 and 11.
- No. 84. Indigestion, September 10 and 11; continued fever, September 7 to 9; malaria, September 26; still sick October 31.
- No. 85. Indigestion, September 10 to 12.
- No. 86. Indigestion, September 10 to 12.
- No. 87. Indigestion, September 10 to 12; malaria, September 17 to 23; continued fever, September 13 to 17. It is quite evident this man's illness extended from September 10 to 23 and that it is probable that this was a mild case of typhoid fever.
- No. 88. Indigestion, September 10 and 11; indigestion, September 14 to 16; malaria, September 16; still sick October 31.
- No. 89. Indigestion, September 10 and 11; malaria, September 20; still sick October 31.
- No. 90. Indigestion, September 10 and 11; diarrhea, September 2 and 3; diarrhea, September 5 and 6.
- No. 91. Indigestion, September 11 to 13; continued fever, September 24; died October 2.
- No. 92. Indigestion, September 11 to 13; indigestion, September 14 and 15; malaria, September 16; still sick October 31.
- No. 93. Indigestion, September 11 and 12; malaria, October 14; still sick October 31.
- No. 94. Indigestion, September 12 to 16; diarrhea, September 21 and 22; diarrhea, September 29 to October 3.
- No. 95. Indigestion, September 12 to 15; malaria, September 16 to 20.
- No. 96. Indigestion, September 13 to 17; malaria, October 18 and 19; diarrhea, September 12 and 13.
- No. 97. Indigestion, September 14 to 16.
- No. 98. Indigestion, September 14 to 18.
- No. 99. Indigestion, September 14 to 16.
- No. 100. Indigestion, September 14 to 18; diarrhea, September 10 to 12.
- No. 101. Indigestion, September 15 and 16; diarrhea, August 13 to 15.
- No. 102. Indigestion, September 15 to 18.
- No. 103. Indigestion, September 15 and 16; malaria, September 24; still sick October 31.
- No. 104. Indigestion, September 15 and 16; malaria, September 17 and 18.
- No. 105. Indigestion, September 15 and 16; malaria, September 24; still sick October 31.
- No. 106. Indigestion, September 15 to 18.
- No. 107. Indigestion, September 15 to 17; continued fever, September 6 to 9.
- No. 108. Indigestion, September 15 and 16.
- No. 109. Indigestion, September 15 to 20.
- No. 110. Indigestion, September 16 to 18; malaria, September 23; still sick October 31.
- No. 111. Indigestion, September 16 and 17; malaria, September 20; still sick October 31.
- No. 112. Indigestion, September 16 to 25.
- No. 113. Indigestion, September 17 and 18; continued fever, October 15; discharged October 24.
- No. 114. Indigestion, September 17 to 22.
- No. 115. Indigestion, September 18 to 21.
- No. 116. Indigestion, September 19 and 20; diarrhea, September 15 to 17.
- No. 117. Indigestion, September 19 and 20.
- No. 118. Indigestion, September 19 and 20; indigestion, September 29 and 30.
- No. 119. Indigestion, September 19 and 20.
- No. 120. Indigestion, September 19 and 20.
- No. 121. Indigestion, September 20 and 21.
- No. 122. Indigestion, September 20 to 22.
- No. 123. Indigestion, September 20 to 22.
- No. 124. Indigestion, September 21 and 22; continued fever, August 12 and 13.
- No. 125. Indigestion, September 21 and 22.
- No. 126. Indigestion, September 21 and 22.
- No. 127. Indigestion, September 21 and 22.
- No. 128. Indigestion, September 21 and 22; indigestion, September 28 to October 1; diarrhea, August 24 to 26; continued fever, August 27 to 29.
- No. 129. Indigestion, September 21 and 22.
- No. 130. Indigestion, September 21 and 22.
- No. 131. Indigestion, September 21 to 23.
- No. 132. Indigestion, September 21 and 22; malaria, September 29; still sick October 31.
- No. 133. Indigestion, September 21 and 22.
- No. 134. Indigestion, September 21 to 24; continued fever, September 25 to 28.
- No. 135. Indigestion, September 22 to 25.
- No. 136. Indigestion, September 24 and 25.
- No. 137. Indigestion, September 24; still sick October 31.
- No. 138. Indigestion, September 24 to 27.
- No. 139. Indigestion, September 24 to 26.
- No. 140. Indigestion, September 25 to 29; diarrhea, September 21 to 23.
- No. 141. Indigestion, September 26 to 29.
- No. 142. Indigestion, September 26 to October 5.
- No. 143. Indigestion, September 26 to 28.
- No. 144. Indigestion, September 27 to October 5.
- No. 145. Indigestion, September 29 to October 1; malaria, October 8; still sick October 31.
- No. 146. Indigestion, September 30 to October 3; diarrhea, September 21 and 22; malaria, October 6; still sick October 31.
- No. 147. Indigestion, September 30 to October 14; diarrhea, August 20 and 21.
- No. 148. Indigestion, October 1 to 3; indigestion, October 4 to 6.
- No. 149. Indigestion, October 1 to 4.
- No. 150. Indigestion, October 2 to 4; malaria, August 29 to September 21. It is evident that this indigestion followed typhoid fever.
- No. 151. Indigestion, October 3 to 6.
- No. 152. Indigestion, October 4 to 8.
- No. 153. Indigestion, October 5 to 8.
- No. 154. Indigestion, October 5 to 7.
- No. 155. Indigestion, October 7 and 8.
- No. 156. Indigestion, October 7 to 12; malaria, October 18; still sick October 31.

No. 157. Indigestion, October 7 to 9; malaria, August 18 to September 25.

No. 158. Indigestion, October 8 to 10.

No. 159. Indigestion, October 9 to 21.

No. 160. Indigestion, October 10 to 16.

No. 161. Indigestion, October 10 to 13.

No. 162. Indigestion, October 10 to 15.

No. 163. Indigestion, October 10 to 13.

No. 164. Indigestion, October 11 and 12.

No. 165. Indigestion, October 11 to 14.

No. 166. Indigestion, October 11 to 14.

No. 167. Indigestion, October 12 to 14.

No. 168. Indigestion, October 12 to 14.

No. 169. Indigestion, October 12 to 15.

No. 170. Indigestion, October 12 to 14.

No. 171. Indigestion, October 12 and 13.

No. 172. Indigestion, October 13 to 14.

No. 173. Indigestion, October 13 and 14.

No. 174. Indigestion, October 13 and 14.

No. 175. Indigestion, October 13 and 14.

No. 176. Indigestion, October 14 to 16.

No. 177. Indigestion, October 15 and 16; diarrhea, September 13 and 14; malaria, October 18; still sick October 31.

No. 178. Indigestion, October 19 and 20.

No. 179. Indigestion, October 19 and 20.

No. 180. Indigestion, October 19 and 20; malaria, September 1 and 2.

No. 181. Indigestion, October 19 and 20.

No. 182. Indigestion, October 20 to 22.

No. 183. Indigestion, October 23 to 31.

With this tabulated information before us, we will attempt to determine the significance of the diagnosis of "indigestion" as used in this regiment. It will be seen that a large proportion of these "indigestions" are not closely associated with any other disease. The number of individuals reported with this form of indigestion is 111, or 60.65 per cent of the total number reported under this diagnosis. Some of these individuals subsequently had the so-called "continued malaria," which was in reality typhoid fever; but the two attacks were so far separated in point of time that we do not believe that one was influenced by the other.

No. 9 is a case of this kind. This man suffered from "indigestion" from July 15 to 17; then returned to duty, and so far as we can learn from the records, remained well until August 29, when he became ill with "continued malaria" and remained sick until October 23.

This kind of indigestion sometimes followed typhoid fever, which is not at all strange. Cases Nos. 150 and 157 are illustrations of this. We have been somewhat surprised to find that only 6.3 per cent of the 111 individuals who had this form of indigestion, subsequently had typhoid fever. We are certainly justified in saying that this form of indigestion did not increase susceptibility to typhoid fever.

The observer will readily pick out cases in the above list in which indigestion was undoubtedly a part of the typhoidal process. These cases number 34 and constitute 18.58 per cent of the total reported "indigestions."

Some of these are of more than passing interest. They illustrate a form of typhoid fever, which we believe to be more prevalent in both civil and military life than is usually supposed. To us these cases indicate that in its earlier stages typhoid fever may, and often is, an inter-

mittent disease. In these cases the intermittent stages of the typhoid fever are not always designated as "indigestion," for the surgeons seemed to have had several names which they apparently used indiscriminately.

In case No. 7 the patient, it seems, had five attacks of "indigestion" before the disease became "continued malarial fever," while No. 20 had scarcely been returned to duty from his first attack of indigestion before the malarial element entered.

In No. 25 it was "simple fever" for the first three days. After an interval of three days more it became "indigestion." This continued for nine days, when the patient had two days rest from disease, when diarrhea came on and proved more powerful than its predecessors, keeping the man off duty for nearly a month.

In No. 28, two attacks of indigestion seemed to have prepared this individual for the malaria, which kept him off duty for nearly two months.

In No. 47, "continued fever" remained for eleven days, and after an interval of six days more, was followed by indigestion, which proved to be much more persistent than the "continued fever."

There are 18 cases in the above list in which the intervals between the "indigestion" and the "continued malaria" are from six to eighteen days. Some interesting questions might be asked concerning these cases. Has the preliminary indisposition any relation to the subsequent typhoid fever? If so, what is this relation? Did the indigestion prepare the body for the specific germ of typhoid fever? Does the indigestion represent the first effects of the typhoid bacillus? If we could answer these questions we might be in a fair way of getting some important information concerning the period of incubation of this disease.

In looking over the above-given list, some noteworthy observations may be made. The "indigestions" reported from June 26 to July 11, inclusive, were evidently more than temporary indispositions. The one of shortest duration (No. 5) continued for eight days. The data concerning No. 41 are not complete, but enough is given to show that the illness continued for some time. This individual reported July 6, and was sent to hospital, where he remained until July 23, when he was sent to quarters. Records leave him sick in quarters until August 13, although one infers that some time between these dates he was returned to duty. However, our general statement that all the "indigestions" reported from June 26 to July 11, inclusive, were more serious and more persistent than the temporary indispositions usually covered by this term, holds good.

Coming to the "indigestions" of August 29 (Nos. 47 to 57, inclusive), we find that all of these are of more than ordinary import. Let us study these cases somewhat more closely. In doing this we find that in all probability August 29 is not the true initial date of some of them.

No. 47 had "continued fever" from August 12 to August 23. The true initial date for Nos. 52 and 54 was

probably August 13. The initial dates to Nos. 49 and 51 seem to have been August 21 and August 22, respectively. There are 2 other cases (Nos. 30 and 31, with initial date of August 21); 1 of these (No. 30) was also followed on August 29 by "indigestion." These 3 cases (Nos. 47, 52, and 54), subsequently developed into typhoid fever, have their initial dates on August 12 and 13, and 3 other cases (Nos. 30, 49, and 51) have their initial dates on August 21 and 22, while all of these, 6 in number, developed typhoid fever August 22. The record does not show that the other cases (48, 50, 53, 55, 56, and 57), 6 in number, that developed typhoid fever August 29, had any preliminary illness.

As has already been stated, this regiment reached Chickamauga May 18, with 1 recognized case of typhoid fever. This patient was kept in the regimental hospital until he died, May 24. According to the testimony of Captain Howe, this patient's excretions were disinfected and buried; and the next typhoid case (however, not diagnosed as such) appeared about the middle of June. Indeed, 3 consecutive cases occurred on the 15th, 16th, and 17th of this month. That of June 15 was diagnosed "gastric fever," and remained off duty until July 3. It is highly probable that this was a mild case of typhoid fever. The case of June 16 was diagnosed as "diarrhea," and the patient was carried to division hospital, where the diagnosis was "continued fever." The last record of this man that we have been able to find is that he was still in hospital August 31.

The case of June 17 was diagnosed "continued fever," and the patient was carried to division hospital, where the diagnosis was changed to typhoid fever. The last record of this man, so far as we have it, is that he was granted sick leave July 18. There can be no doubt that typhoid fever did reappear in this command about the middle of June. For two months after this date the cases of "continued fever" were not numerous. About the middle of August there was an explosive outbreak of the disease.

Besides the cases of typhoid fever that we have already detected in the regimental reports, 40 cases diagnosed as typhoid fever or "continued malaria" appear in the hospital records from this regiment which the regimental records do not mention.

The following is a summary of the cases of typhoid fever in the regiment:

Number of cases diagnosed in the regiment as typhoid fever..	2
Number of cases of protracted fever diagnosed in the regiment as "malaria"	203
Number of cases of protracted fever diagnosed in the regiment as "diarrhea"	9
Number of cases of protracted fever diagnosed in the regiment as "gastritis"	9
Number of cases of protracted fever diagnosed in the regiment as "indigestion"	24
Number of cases without any regimental diagnosis, but found in the hospital records diagnosed as typhoid fever or "continued malarial fever"	43
Total	290

Under the still more indefinite terms of "gastritis," "gastric fever," and "gastric disturbances," 27 cases are reported. Nine of these are believed by us to have been typhoid fever, and are included in our estimate of the number of typhoid cases in the regiment. These cases are as follows:

No. 1. Gastric fever, September 15; sent to division hospital on the same date. Here the disease was diagnosed as typhoid fever, and the patient was furloughed October 24.

No. 2. Gastric fever, September 27; still sick October 31.

No. 3. Gastric fever, September 28 to October 13.

No. 4. Gastric fever, June 15 to July 3.

No. 5. Gastric fever, August 29 to October 23.

No. 6. Gastritis, September 24 to October 3.

No. 7. Gastritis, September 30; still sick October 31.

No. 8. Gastric fever, June 21 to September 28. This man was sent to division hospital and here his disease was diagnosed typhoid fever.

No. 9. Gastric fever, June 20; sent to division hospital July 12. Disease was here diagnosed typhoid fever, and the man was furloughed July 27.

Nine cases were diagnosed as dysentery. One of these appeared on sick report August 13. His disposition is not given and there is no record that he was returned to duty. However, it is altogether likely that his illness was of short duration and that the failure to report his return to duty was due to clerical error.

One case diagnosed as dysentery was sent to Fort Thomas September 23. This man remained at Fort Thomas under the same diagnosis until October 8, when he was furloughed.

The third case of dysentery appeared on the sick report October 26 and was left incomplete October 31. Of the remaining cases of dysentery no one remained off duty longer than twenty-four hours.

SUMMARY.

Assembled at Toledo, Ohio, April 25, 1898.

Went to Columbus, Ohio, April 29, 1898.

Mustered into the United States service May 12, 1898.

Arrived at Chickamauga Park May 18, 1898.

Strength on arrival, 864.

Date of first case of probable typhoid fever, May 18, 1898.

Date of first case of recognized typhoid fever, May 18, 1898.

Left Chickamauga August 27, 1898.

Strength on departure, 1,299.

Number of cases of probable typhoid fever developed at Chickamauga	70
Number of cases of probable typhoid fever developed at Knoxville:	
From August 28 to 31	45
During September	125
During October	41
During November	10

Total number of cases of probable typhoid fever developed in the Sixth Ohio Volunteer Infantry from May to November, 1898

These 291 cases were diagnosed as follows:

Typhoid fever	148
Continued fever	22
Malaria	86
Gastritis	3
Diarrhea	8
Indigestion	18

Enteritis.....	1
Dysentery.....	1
Fever and hemorrhage.....	1
Gastric fever.....	2
Gastralgia.....	1
Total.....	291

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Baumgardner, Frank C.	2d Lt.	1898, Aug. 22	Chattanooga, Tenn.	Typhoid.
Brower, Homer F.....	Pvt., H.	Dec. 2	Camp Poland, Tenn.	Do.
Craig, Frank W.....	Pvt., I.	Oct. 5	Sick at Clyde, Ohio, with typhoid; died October 5, 1898, with a complication of pneumonia.	Do.
Dale, Will W.....	Pvt., D.	Oct. 6	Fostoria, Ohio.....	Do.
Droessler, Frank J.....	Pvt., A.	Oct. 2	Camp Poland, Tenn.	Do.
Edwards, William S.....	Corpl., F.	Aug. 21	Camp Thomas, Ga.....	Enteric fever.
Englehart, William S.....	Pvt., H.	Aug. 26	.....do.....	Typhoid.
Gardner, Joseph.....	Pvt., M.	Oct. 31	Second Division hospital, Second Brigade, First Army Corps.	Do.
Kenson, W. A.....	(?)	Aug. 31	Division hospital.....	Do.
Kindig, Edward.....	Pvt., M.	Aug. 21	Camp Thomas, Ga.....	Fever.
Kistner, Rawson J.....	Pvt., D.	Oct. 10	Camp Poland, Tenn.....	Typhoid.
Rittenhouse, Frank C.....	Pvt., G.	Nov. 26	.....do.....	Cerebral paralysis.
Shetleroe, Slonious.....	Pvt., L.	Sept. 14	Toledo, Ohio.....	Typhoid.
Smith, John H., jr.....	Pvt., H.	June 7	Camp Thomas, Ga.....	Uremia.
Sullinger, Charles W.....	Pvt., E.	Nov. 21	Stryker, Ohio, while on sick leave.	Typhoid.
Terry, Ellis M.....	Pvt., G.	Oct. 30	Camp Poland, Tenn.....	Do.
Waldner, Henry.....	Pvt., E.	Aug. 30	Chickamauga, Ga.....	Do.
Wandtke, Herman.....	Pvt., C.	Sept. 1	Toledo, Ohio.....	Do.
Ward, John A.....	Pvt., I.	Nov. 12	Camp Poland, Tenn.....	Do.
Williams, Samuel S.....	Pvt., G.	May 24	Camp Thomas, Ga.....	Do.
Whethorn, W.....	Pvt., G.	Sept. 7	.....do.....	Do.
Total deaths.....				21
Deaths due to typhoid fever.....				19
Percentage of deaths among cases of probable typhoid fever (291), 6.52.				
Percentage of deaths among recognized cases of typhoid fever (148), 12.83.				

COMMUNICATIONS FROM THE SURGEONS IN THE SIXTH OHIO.

Medical officers.

Park L. Meyers, major and surgeon, Fostoria, Ohio.

John Howe, captain and assistant surgeon, Toledo, Ohio.

Under date of July 17, 1899, Captain Howe furnished us with the following additional information concerning this regiment:

I submit herewith a brief review of the sanitary condition of each camp occupied by the Sixth Ohio Volunteer Infantry:

First. Camp Bushnell, Columbus, Ohio. The general lay of the ground occupied by this regiment at Camp Bushnell was poorly adapted to camping purposes, being not properly drained. Moreover, before our arrival this site had been used by adjoining troops as a general dumping ground, being literally covered with fecal matter. A detail was at once put to work to bury the accumulated filth, and the ground was made as clean as possible under the circumstances. The sinks were at the regulation distance from the camp, and their contents were covered with dirt and lime twice a day. The water supply was the same as that furnished the city of Columbus. The water was used without boiling or filtration.

Second. Camp George H. Thomas, Chickamauga Park, Ga. Our camp site here was very good in every way, except, perhaps, there was an overabundance of shade. The ground was rolling and permitted natural drainage, but we were too much crowded to secure good sanitary conditions. We were separated by a distance of about 100 feet from the One hundred and Fifty-eighth Indiana on one side and by about 200 feet from the First West Virginia

on the opposite side. The sinks of both the Sixth Ohio and the First West Virginia were within the 200 feet of space intervening between these camps. On account of the limited space we were obliged to have battalion instead of company sinks. These sinks were poorly constructed on account of scarcity of lumber. They were boarded up on the back and sides, leaving the front entirely open and the building without any roof. The contents were lined and covered with earth twice a day, but on account of the open condition of the superstructure they were frequently flooded by the heavy rains, and the contents overflowed and polluted the ground for a considerable distance about them. It was impossible to prevent the overflowing of these sinks by ditching, because being without roofs the heavy rains would fill them and cause them to overflow. New sinks could not be dug as often as they should have been on account of the limited space. We could not place our sinks in any other location because we were surrounded on either side by regiments and on the fourth side by the brigade drill grounds. Flies literally swarmed about the sinks, kitchens, and mess tables. Our camp was not moved during our stay of three months at this place, nor were those of the other regiments in our brigade. Our water supply was obtained during the early part of our stay at Chickamauga from adjacent wells. These wells were, however, soon exhausted, and the supply from that time on was hauled in barrels from a spring 5 miles distant which gushed up through the rocks clear and cold and was undoubtedly pure and wholesome, this source being remote from habitations and encampments. Each company was provided with a barrel for the storing of its drinking water. A few of these barrels had spigots near the bottom. In the majority of the cases, however, the men dipped the water from the barrels in cups. In my opinion, this was a means of contaminating the water by contact with unclean hands. Orders for boiling the water could not be carried out on account of the lack of proper utensils. Filters were furnished each company but were of little service. On account of our limited space the tents could not be moved to new ground, but they were lowered about once a week and the ground where they stood was exposed to the sun.

Third. Camp Poland, Knoxville, Tenn. As you made a personal inspection of our camp at Knoxville you are familiar with the sanitary conditions at that place. This was a great improvement over our former camps, especially in the arrangement and care of sinks. The "cat" system was inaugurated at Camp Poland.

Fourth. Camp in Cuba. Here our camp was located about 2½ miles from Cienfuegos. From a sanitary standpoint the location was a most excellent one. There was good surface drainage. The water was obtained from an artesian well and was always boiled. As there was unlimited room the sinks were located fully 150 yards from the camp. The system of covering individual discharges was rigidly enforced. No cases of typhoid fever developed while in Cuba.

Fifth. Camps on Dafueski Island and at Augusta, Ga. These locations occupied by our regiment on returning from Cuba were in most excellent condition.

FIRST WEST VIRGINIA VOLUNTEER INFANTRY.

Second Brigade, Second Division, First Army Corps.

This regiment assembled at Charleston, W. Va., and encamped on the Kanawha River about 2 miles above the city. The men began to arrive at this place April 26, and the regiment remained here until May 18, when it departed for Chickamauga Park, Ga.

According to the testimony of Major Shafer, the water used at Charleston was obtained from the Kanawha River and was distributed through the camp in barrels. This water was believed to be all right, with the exception of the fact that it was sometimes muddy.

Fecal matter was deposited in pits and was covered with earth once a day. There is no record of sickness in this regiment at Charleston.

This command reached Chickamauga Park May 20 and was brigaded with the Sixth Ohio and the One hundred and fifty-eighth Indiana. This brigade was located near Jay's mill. The site of the regimental camp was in an open wood on a sloping and well-drained knoll. During the first weeks of encampment at this place the drinking water was obtained from wells. The well at Jay's mill first furnished the water. Another well near the southern line of the regimental camp was soon exhausted, the pump broken, and no water was afterwards obtained from this source. A third well was bored within the regimental lines, but after a short time the fear of its being contaminated led the officers to forbid the use of water from this source. After this, and during the greater part of the stay at Chickamauga, drinking water was brought in barrels from Blue Spring, which is located outside the park and some miles from any of the encampments. The location of the brigade was quite distant from the nearest pipes carrying Chickamauga Creek water, and the men of this regiment could have obtained water from this source only at rare intervals when off duty. None of the drill movements brought this regiment near the pipe lines, and the water of Chickamauga Creek must be excluded from the possible sources of the typhoid fever that prevailed in this command.

The fecal matter was deposited in sinks dug on the slope of the knoll above the regiment. On account of the rocky nature of the soil these sinks, according to the testimony of Major Shafer, could not be dug more than 50 inches deep. These pits became very foul, and after heavy rains their contents occasionally overflowed.

The first order issued in this command after its arrival at Chickamauga is the following, dated May 25, 1898:

AN ORDER TO FURTHER PRESERVE THE HEALTH OF THE COMMAND
AND PREVENT THE OCCURRENCE OF INFECTIOUS DISEASES.

Kitchen sinks.—4 by 4 by 6 feet deep. No solid material to be thrown in; only for dish water. Solid refuse to be burned. Once a day kitchen sinks to be covered with 2 or 3 inches of earth.

Company sinks.—At least 2 by 3 feet, excavated to a depth of 8 feet. Once each day the contents of the sink must be covered with 3 inches of soil.

The order providing for the individual covering of feces is said to have originated in this regiment. The following is a copy:

HEADQUARTERS FIRST WEST VIRGINIA VOLUNTEER INFANTRY,
Camp George H. Thomas, July 9, 1898.

Special Orders, No. 16.

Paragraph 1. In order to prevent the transfer of typhoid germs from fecal matter to the food through the agency of flies carrying them on their feet, a shovel will be kept at each sink and every man in camp required to cover his own deposit. Any neglect of this precaution will be promptly reported to the company commander by any man observing the same. Inspection will be made

to see that this order is carried out and, if necessary, a sentinel will be placed at each sink.

Paragraph 2. All members of the regiment are cautioned against using the water from Jay's mill pump or springs in the vicinity of the camp for any purposes without first boiling the same.

SPILLMAN, *Colonel.*

VANCE, *Lieutenant and Acting Adjutant.*

As has already been stated, the rocky nature of the soil prevented the digging of sinks to the depth demanded in the order. However, these orders show that the officers of this regiment were fully alive to the dangers of the spreading of infection, and a special interest attaches to the study of the progress of typhoid fever in this command. It may be very properly asked how nearly were the above-given orders carried out.

This command was inspected by our board after its transfer to Knoxville. At this place the site was excellent, and the character of the soil did not possess the objectionable features of that at Chickamauga. It is only fair to preface the following statement by saying that at the time of our inspection the regimental surgeon, Major Baguley, had been for some weeks detached from the regiment and was then in charge of the division hospital, and the colonel was absent on sick leave. The following is an abstract from our stenographic notes on inspecting this command:

Sinks.—Floor at one found to be dirty and covered with flies; fecal matter badly exposed. It was said that this sink was used by the corral men. A sentry stated that the fecal matter was covered three times a day. A man using the fourth sink said that the soldiers covered each individual deposit. Taken altogether, the sinks are in fair condition compared with other sinks at Knoxville.

This regiment remained at Chickamauga until August 26, when it was moved to Knoxville.

In the report for May, Major Baguley makes the following statement:

The sanitary condition of the regimental camp is good. The prevailing diseases are diarrhea and dysentery, the sequelæ to acute gastritis, and due to indiscretions in diet. Six hundred and six cases of diarrhea, dysentery, vaccinia, and other minor disabilities were treated during the period covered by this report, a large percent of the vaccinations being primary.

Evidently the mild cases referred to in the above quotation from the regimental surgeon were not included in the May report.

CONDENSED SICK REPORT FROM MAY 18 TO MAY 31, INCLUSIVE.

Mean strength	1,011
Gastritis	7
Indigestion	5
Other diseases	20
Total	32

In the June report Captain Gilham, then in charge, makes the following statement:

The sanitary condition of the regimental camp has been good. Jay's mill well at north side of camp is susceptible of being contaminated. The use of this water has been prohibited. The prevailing diseases are diarrhea and gastro-enteritis, caused by indiscretions in diet.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,167
Gastritis	4
Indigestion	127
Gastro-enteritis	12
Diarrhea	27
Dysentery	49
Simple continued fever	17
Typhoid fever (?)	2
Other diseases	126
Total	364

In the July report, also made by Captain Gilham, we find the following:

The health of the command has been good. The sanitary conditions of the camp are good.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,320
Typhoid fever	7
Simple continued fever	19
Indigestion	43
Gastro-enteritis	17
Diarrhea	22
Dysentery	7
Gastritis	2
Enteritis	1
Other diseases	104
Total	222

It will be observed that, although the mean strength is 153 more than that for June, the total sickness is less by 142. Comparatively this is a good showing.

In the August report Lieutenant Nesbitt, surgeon in charge, makes the following statement:

The condition of camp from a sanitary standpoint is good. The prevailing disease is malaria, many cases of this disease having developed since the command left Chickamauga Park.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,169
Typhoid fever	3
Simple continued fever	9
Remittent malaria	108
Diarrhea	80
Indigestion	101
Dysentery	6
Gastro-enteritis	6
Gastritis	1
Undiagnosed fever	1
Other diseases	131
Total	446

It will be seen that the total number of sick in August is twice as great as it was in July, and that malaria, which was not reported at all in June and July, is now represented by 108 cases. The cases of recognized typhoid fever are decreased to less than half, and as 2 of these reported in August are brought over from July, the actual number of cases developed in this command is reduced to 1. If this report could be accepted as true, the condition of the command, so far as typhoid fever is concerned, would be most satisfactory. We will return to a consideration of this point later.

In the September report Lieutenant Nesbitt, surgeon in charge, states as follows:

The prevailing diseases are malaria and gastro-enteric catarrh. Location of camp is excellent and the general health of the command is rapidly improving. Typhoid fever is gradually disappearing.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,281
Typhoid and suspects	25
Diarrhea	67
Indigestion	94
Dysentery	5
Gastritis	74
Gastro-enteritis	29
Remittent malaria	168
Simple continued fever	3
Other diseases	118
Total	583

The surgeon in charge seems to have been without warrant in making the statement in this report that "typhoid fever is gradually disappearing."

We fail to find justification for this statement in his own report, inasmuch as he registered 3 cases of typhoid fever in August and 25 in September. Likewise the statement is not fulfilled in the October report, for in that he recognizes 26 cases of typhoid fever.

In the October report Lieutenant Nesbitt states:

The condition of this command is very much improved. The prevailing causes of sickness have been malarial and venereal infections. The men of this regiment are at this time in excellent physical condition. Patients furloughed from division hospital are carried on this report as sick in division hospital.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,254
Typhoid fever	26
Remittent malaria	75
Diarrhea	36
Gastro-enteritis	19
Gastritis	40
Indigestion	66
Dysentery	2
Gastric catarrh	3
Other diseases (largely venereal and jaundice)	219
Total	486

We will now enter upon a critical study of the diseases covered by these reports. In the first place, we will take up the intestinal disorders.

The terms "indigestion," "diarrhea," "dysentery," "gastritis," and "gastro-enteritis" seem to have been used indiscriminately. In order to get an opinion of the nature of the diseases covered by these diagnoses we will give a complete list of all the cases in this regiment covered by these diagnoses.

Company A.

- No. 1. Indigestion, June 1 and 2.
- No. 2. Indigestion, June 1 to 3; diarrhea, July 1 to 4; malaria, September 14 and 15; gastritis, September 30 and October 7.
- No. 3. Indigestion, June 2 to 9.

No. 4. Dysentery, June 3 to 6; malaria, September 1; sick, October 31. The last illness of this man was probably typhoid fever.

No. 5. Indigestion, June 5 to 9.

No. 6. Indigestion, June 5 to 8; malaria, September 1 to 14; the last illness in this case was probably mild typhoid fever.

No. 7. Dysentery, June 6 to 9; gastritis, September 20 to 23.

No. 8. Indigestion, June 6 to 9; diarrhea, June 16 to 18; continued fever, June 23 to July 13. This was a case of typhoid fever.

No. 9. Indigestion, June 6 to 9.

No. 10. Indigestion, June 6 to 9; alcoholic gastritis, October 3 to 8.

No. 11. Indigestion, June 7 to 10; dysentery, August 31 to September 1.

No. 12. Gastro-enteritis, June 7 to 10.

No. 13. Dysentery, June 9 to 15; indigestion, June 25 to 27.

No. 14. Indigestion, June 12 to 17.

No. 15. Indigestion, June 12 to 17; dysentery, August 15 to 19.

No. 16. Indigestion, June 14 to 16.

No. 17. Indigestion, June 16 to 18; diarrhea, August 12 to 24. The last illness in this case may have been typhoid fever.

No. 18. Indigestion, June 16 to 20.

No. 19. Indigestion, June 17 to 20; gastritis, July 12 to 14; indigestion, September 29 to October 5.

No. 20. Indigestion, June 18 to 20.

No. 21. Indigestion, June 18 to 20.

No. 22. Indigestion, June 20 to 22.

No. 23. Indigestion, June 20 to 22.

No. 24. Indigestion, June 22 to 30.

No. 25. Indigestion, June 23 to 27.

No. 26. Indigestion, June 25 to 27.

No. 27. Indigestion, June 25 to 27.

No. 28. Indigestion, June 25 to 27.

No. 29. Indigestion, June 29 to July 2.

No. 30. Indigestion, July 1 and 2.

No. 31. Indigestion, July 1 to 3.

No. 32. Alcoholic gastritis, July 7 to 13.

No. 33. Indigestion, July 12 and 13.

No. 34. Indigestion, July 16 to 18.

No. 35. Diarrhea, July 29 and 30; diarrhea, September 1 and 2.

No. 36. Diarrhea, August 4 to 7.

No. 37. Indigestion, August 6 to 10; gastritis, October 4 to 6.

No. 38. Diarrhea, August 12 to 22.

No. 39. Diarrhea, August 12 to 14; diarrhea, September 28 and 29.

No. 40. Diarrhea, August 16 and 17; gastritis, September 9 to 11.

No. 41. Indigestion, August 21 to 23; typhoid fever September 20; sent to division hospital September 23.

No. 42. Diarrhea, August 24 to 26; indigestion, August 30 and 31.

No. 43. Diarrhea, August 29 and 30.

No. 44. Indigestion, August 30 and 31.

No. 45. Gastritis, August 23; sent to division hospital September 2.

No. 46. Indigestion, August 30; sent to division hospital August 31; furloughed, September 21.

No. 47. Diarrhea, September 1 and 2.

No. 48. Indigestion, September 2 to 4; diarrhea, September 2 to 5.

No. 49. Indigestion, September 3 to 5.

No. 50. Gastritis, September 9 to 11; gastro-enteritis, September 25 to October 2.

No. 51. Gastro-enteritis, September 12 to 27; gastritis, September 28 to October 16.

No. 52. Indigestion, September 13 and 14.

No. 53. Gastritis, September 14 to 16.

No. 54. Gastritis, September 14 to 16; indigestion, October 5 and 6; gastro-enteritis, October 8; sent to division hospital October 8. This proved to be a case of typhoid fever.

No. 55. Indigestion, September 14 to 16; indigestion, September 19 and 20.

No. 56. Indigestion, September 17 and 18.

No. 57. Gastritis, September 18 to 21.

No. 58. Gastro-enteritis, September 24 to October 9. This might have been a case of typhoid fever.

No. 59. Gastro-enteritis, September 25; no disposition is given in this case.

No. 60. Diarrhea, October 10 to 13.

No. 61. Diarrhea, October 12 and 13.

No. 62. Indigestion, October 13 to 15.

No. 63. Indigestion, October 17 to 19.

No. 64. Indigestion, October 20 and 21.

Company B.

No. 1. Gastritis, May 19 to 22; indigestion, September 23 and 24.

No. 2. Indigestion, June 3 to 6; indigestion, July 13 and 14; gastro-enteritis, September 30 to October 3.

No. 3. Dysentery, June 5 to 10.

No. 4. Diarrhea, June 7 to 10.

No. 5. Diarrhea, June 7 to 10.

No. 6. Dysentery, June 7 to 11.

No. 7. Indigestion, June 10 to 12; dysentery, September 19; sent to division hospital September 20; still sick October 31.

No. 8. Dysentery, June 11 to 15; dysentery, July 13 to 19; malaria, September 7 to 9.

No. 9. Indigestion, June 13 to 18; indigestion, June 18 to 21; indigestion, June 25 to 30; malaria, August 25; sent to division hospital September 2; furloughed September 9. This was a case of typhoid fever.

No. 10. Indigestion, June 13 to 16; indigestion, September 26 to 28.

No. 11. Dysentery, June 14 to 16; diarrhea, August 25 to 27.

No. 12. Dysentery, June 14 to 16; malaria, October 6; furloughed November 8. This was a case of typhoid fever.

No. 13. Dysentery, June 14 to 17.

No. 14. Indigestion, June 17 to 20; malaria, August 28 to September 2; malaria, September 12 to 30. This was probably a case of typhoid fever.

No. 15. Indigestion, June 16 to 19; indigestion, August 15 to 17; malaria, September 19 to 24; diarrhea, September 28; sent to division hospital October 11; furloughed October 29.

No. 16. Dysentery, June 17 to 20; malaria, August 21 to 23; malaria, September 2; sent to division hospital September 4; returned to quarters September 11; returned to division hospital September 16; still sick October 31.

No. 17. Dysentery, June 18 to 21; malaria, September 19 to 26; gastritis, September 27 to October 1.

No. 18. Dysentery, June 18 to 20; indigestion, September 23 and 24; gastritis, October 3 to 11.

No. 19. Dysentery, June 18 to 20; indigestion, September 29 to October 12.

No. 20. Indigestion, June 19 to 22; diarrhea, August 26 to 30; gastro-enteritis, September 20 to 25.

No. 21. Dysentery, June 19 to 23.

No. 22. Indigestion, June 22 to 24; typhoid fever, July 11 to August 11.

No. 23. Dysentery, June 23 to 26; malaria, August 31 to September 2; malaria, October 13; still sick October 31.

No. 24. Indigestion, June 24 to 26.

No. 25. Indigestion, June 24 to 28; indigestion, August 18 and 19.

No. 26. Indigestion, June 26 to 28.

No. 27. Diarrhea, July 4 to 7; indigestion, August 3 and 4.

No. 28. Indigestion, July 6 to 9.

No. 29. Gastro-enteritis, July 7 to 13.

No. 30. Indigestion, July 8 to 10; diarrhea, August 10 to 14.

No. 31. Diarrhea, July 11 and 12.

No. 32. Diarrhea, July 12 and 13.

No. 33. Diarrhea, July 21 to 23; malaria, August 26; sent to division hospital, September 21; returned to sick quarters, October 14; returned to duty October 20.

No. 34. Diarrhea, August 11 to 24.

- No. 35. Indigestion, August 12 to 15; malaria, September 6 and 7.
 No. 36. Diarrhea, August 12 to 15; malaria, August 30; sent to division hospital, September 1; returned to duty October 20.
 No. 37. Indigestion, August 14 to 19.
 No. 38. Diarrhea, August 15 and 16; gastritis, September 7 to 9.
 No. 39. Indigestion, August 16 to 19.
 No. 40. Indigestion, August 24 and 25.
 No. 41. Diarrhea, August 26 to 28.
 No. 42. Diarrhea, August 9 to September 1.
 No. 43. Indigestion, September 3 and 4; indigestion, September 22 and 23; indigestion, October 12 to 14; indigestion, October 22 and 23.
 No. 44. Indigestion, September 14 to 16.
 No. 45. Diarrhea, September 29 and 30.
 No. 46. Gastritis, September 18; sent to division hospital September 29; here the disease was diagnosed typhoid fever.
 No. 47. Gastro-enteritis, September 24. The disposition of this patient is not given.
 No. 48. Gastritis, October 1 to 15; indigestion, October 17 to 21.
 No. 49. Diarrhea, October 6 to 8.
 No. 50. Diarrhea, October 6 to 8.
 No. 51. Indigestion, October 6 and 7.
 No. 52. Gastro-enteritis, October 9 to 14.
 No. 53. Gastritis, October 9 to 11.
 No. 54. Gastritis, October 10 to 13.
 No. 55. Indigestion, October 13 to 16.
 No. 56. Diarrhea, October 17 to 19.
 No. 57. Gastritis, October 19 and 20.

Company C.

- No. 1. Gastritis, May 23 to 25; gastric catarrh, October 27; still sick October 31.
 No. 2. Gastritis, May 23 to 25; indigestion, June 4 to 6.
 No. 3. Gastritis, May 29 to June 1.
 No. 4. Gastritis, May 30 to June 3.
 No. 5. Gastritis, September 11 to 13.
 No. 6. Gastritis, May 30 to June 3.
 No. 7. Indigestion, May 29 to June 3; malaria, September 9 to 14.
 No. 8. Indigestion, June 3 to 7; indigestion, June 17 to 19.
 No. 9. Indigestion, June 8 to 13; indigestion, July 11 and 12; indigestion, August 12 to 14.
 No. 10. Indigestion, June 8 to 12; malaria, August 13 to 20; gastritis, September 30 to October 10.
 No. 11. Indigestion, June 20 to 22.
 No. 12. Dysentery, June 20 to 30; diarrhea, July 6 to 9; indigestion, July 11 to 13.
 No. 13. Dysentery, June 23 to 26; malaria, August 16 to 20.
 No. 14. Indigestion, June 23 to 27; diarrhea, October 11 to 13.
 No. 15. Dysentery, June 23 to 29; diarrhea, July 1 to 4.
 No. 16. Indigestion, June 24 to 30; diarrhea, August 10 to 14.
 No. 17. Diarrhea, August 28 to 30.
 No. 18. Gastro-enteritis, June 22 to July 30.
 No. 19. Gastro-enteritis, June 27; sent to division hospital June 29; sent to sick quarters July 6; returned to duty July 7; diarrhea, August 15 to 19.
 No. 20. Gastro-enteritis, June 27 to July 9; malaria, August 8 to 13; diarrhea, September 18 to 19.
 No. 21. Indigestion, July 3 to 5; malaria, September 9 to 14.
 No. 22. Indigestion, July 2 to 4; diarrhea, August 11 and 12.
 No. 23. Indigestion, August 3 and 4; diarrhea, September 2 to 4; gastritis, September 15 to 18; diarrhea, October 6 and 7; indigestion, October 10 and 11.
 No. 24. Indigestion, August 5 to 11.
 No. 25. Indigestion, August 11 to 14.
 No. 26. Indigestion, August 17 and 18; typhoid fever, September 18 to October 30.
 No. 27. Indigestion, August 19 to 23.

- No. 28. Diarrhea, August 31; sent to division hospital September 3; returned to duty October 30.
 No. 29. Diarrhea, August 31; sent to division hospital September 12; returned to duty October 12.
 No. 30. Diarrhea, September 7 to 10.
 No. 31. Indigestion, September 11 and 12; diarrhea, October 13 and 14.
 No. 32. Gastritis, September 4 to 17.
 No. 33. Indigestion, September 15 to 17.
 No. 34. Indigestion, September 18 and 19.
 No. 35. Gastro-enteritis, September 19 to 25; gastritis, October 1; sent to division hospital October 4; sick October 31.
 No. 36. Gastritis, October 1 to 10.
 No. 37. Indigestion, October 6 to 9.
 No. 38. Indigestion, October 20 and 21.
 No. 39. Gastric catarrh, October 27. No disposition given.
 No. 40. Diarrhea, June 29. No disposition given, but from the reports it would appear that this man continued sick to July 31.

Company D.

- No. 1. Indigestion, June 3 to 7; typhoid fever, June 20; furloughed, July 27; indigestion, October 13 to 20.
 No. 2. Indigestion, June 9 and 10; dysentery, June 23 to 25; indigestion, August 11 and 12; dysentery, August 19; sent to division hospital August 25; here the disease was diagnosed typhoid fever and the patient was furloughed September 1.
 No. 3. Dysentery, June 10 to 12.
 No. 4. Indigestion, June 13 to 17.
 No. 5. Indigestion, June 13 to 16.
 No. 6. Indigestion, June 13 to 16; indigestion, June 25 to 27; indigestion, July 21 to 24; malaria, August 13 to September 22; gastritis, September 22 to October 10.
 No. 7. Indigestion, June 18 to 20.
 No. 8. Dysentery, June 21 to 25.
 No. 9. Indigestion, June 22 to 26.
 No. 10. Dysentery, June 22 to 29; gastro-enteritis, July 5 to 11.
 No. 11. Dysentery, June 22 to 29.
 No. 12. Dysentery, June 22 to 29; malaria, August 17 to 25.
 No. 13. Dysentery, June 22 to 24.
 No. 14. Dysentery, June 23 to 26; diarrhea, September 6 to 9; gastritis, September 17 to 19.
 No. 15. Diarrhea, June 27 to 29.
 No. 16. Diarrhea, June 25 to 27.
 No. 17. Indigestion, June 25 to 27; gastro-enteritis, July 3 to 10; indigestion, August 21 and 22; gastritis, September 19 to 22.
 No. 18. Dysentery, June 28 to 30.
 No. 19. Gastro-enteritis, July 1 to 6; diarrhea, October 19 and 20.
 No. 20. Indigestion, July 1 to 3; diarrhea, August 9 to 12.
 No. 21. Indigestion, July 4 to 6; malaria, August 21 to 26.
 No. 22. Gastro-enteritis, July 9 to 14.
 No. 23. Gastro-enteritis, July 9 to 13.
 No. 24. Indigestion, July 10 to 14; malaria, September 13 to 19.
 No. 25. Indigestion, August 4 to 9.
 No. 26. Diarrhea, August 8 and 9; indigestion, September 19 to 21.
 No. 27. Diarrhea, August 17 and 18; indigestion, October 13 and 14.
 No. 28. Diarrhea, August 18 to 22.
 No. 29. Indigestion, August 21 and 22; diarrhea, September 6 to 9.
 No. 30. Indigestion, August 23 to 27; indigestion, September 6 and 7; indigestion, October 5 to 10.
 No. 31. Diarrhea, August 24 to 26.
 No. 32. Indigestion, August 24 to 28.
 No. 33. Indigestion, August 28 and 29; gastritis, September 13 to 16.
 No. 34. Indigestion, August 30 and 31; gastritis, September 1 to 4.
 No. 35. Indigestion, August 16; furloughed August 26.
 No. 36. Indigestion, August 31 to September 1; gastritis, September 14 and 15.

- No. 37. Indigestion, September 15 to 24.
- No. 38. Diarrhea, September 2 to 4; indigestion, September 9 and 10; gastro-enteritis, September 15 to 20.
- No. 39. Diarrhea, September 2 and 3.
- No. 40. Indigestion, September 7 and 8.
- No. 41. Indigestion, September 11 and 12.
- No. 42. Indigestion, September 13 and 14.
- No. 43. Indigestion, September 14 and 15.
- No. 44. Indigestion, September 15 and 16; gastritis, September 19 to 30.
- No. 45. Gastritis, September 17 to 19.
- No. 46. Gastritis, September 20 to 23.
- No. 47. Gastritis, September 21 to 25.
- No. 48. Diarrhea, September 21 to 25.
- No. 49. Gastritis, September 22 to 24.
- No. 50. Gastritis, September 24 to 27.
- No. 51. Gastritis, September 18; sent to division hospital September 26; still sick October 31.
- No. 52. Gastritis, September 28 to October 2.
- No. 53. Indigestion, October 1 and 2.
- No. 54. Indigestion, October 6 to 10.
- No. 55. Diarrhea, October 14 and 15.
- No. 56. Indigestion, October 17 to 19.

Company E.

- No. 1. Indigestion, June 1 to 4.
- No. 2. Indigestion, June 9 to 13.
- No. 3. Indigestion, June 9 to 11.
- No. 4. Indigestion, June 20 to 22; malaria, September 16 to 22.
- No. 5. Diarrhea, June 23 to 25; diarrhea, August 18 to 28.
- No. 6. Diarrhea, June 25 to 27.
- No. 7. Diarrhea, June 27 to 30.
- No. 8. Indigestion, July 5 to 7.
- No. 9. Gastro-enteritis, July 5 to 11.
- No. 10. Gastritis, July 12 to 20; malaria, September 3; sent to division hospital September 11; returned to quarters October 3; returned to duty October 19.
- No. 11. Diarrhea, August 6 and 7.
- No. 12. Diarrhea, August 9 and 10.
- No. 13. Indigestion, August 9 to 13.
- No. 14. Indigestion, August 9 to 13; gastritis, September 11 to 16; indigestion September 30 to October 9.
- No. 15. Indigestion, August 11 and 12.
- No. 16. Indigestion, August 12 and 13.
- No. 17. Indigestion, August 12 and 13.
- No. 18. Indigestion, August 13 to 18.
- No. 19. Indigestion, August 16 and 17; indigestion, August 25 to 28; gastritis, September 14 to 16.
- No. 20. Diarrhea, August 18 and 19.
- No. 21. Indigestion, August 18 and 19; indigestion, August 22 and 23.
- No. 22. Indigestion, August 19 and 20.
- No. 23. Indigestion, August 24 to 26.
- No. 24. Indigestion, August 29 and 30.
- No. 25. Diarrhea, August 6; no disposition given.
- No. 26. Indigestion, August 30 to September 4.
- No. 27. Indigestion, September 1 to 4.
- No. 28. Indigestion, September 1 to 4.
- No. 29. Indigestion, September 1 to 4.
- No. 30. Gastritis, September 2 to 9.
- No. 31. Indigestion, September 7 to 13.
- No. 32. Diarrhea, September 7 to 9.
- No. 33. Diarrhea, September 7 to 9; indigestion, October 6 to 11.
- No. 34. Gastritis, September 9 to 12; indigestion, September 17 and 18.
- No. 35. Indigestion, September 10 and 11.
- No. 36. Gastro-enteritis, September 12 to 17.
- No. 37. Indigestion, September 11 to 14.
- No. 38. September 14 to 16; gastritis, September 26 to October 3.

- No. 39. Gastritis, September 16 to 18; typhoid, October 10; sent to division hospital October 11.
- No. 40. Diarrhea, September 24 and 25.
- No. 41. Gastritis, September 26; no disposition given.
- No. 42. Indigestion, September 26 to October 13.
- No. 43. Gastritis, September 30 to October 3.
- No. 44. Gastritis, September 30; no disposition given.
- No. 45. Indigestion, October 18 and 19.

Company F.

- No. 1. Indigestion, May 28 and 29; indigestion, September 12 and 13; gastritis, October 15 and 16.
- No. 2. Indigestion, June 27 to July 1.
- No. 3. Indigestion, June 1 to 4; gastritis, September 17 to 19.
- No. 4. Indigestion, June 3 to 7.
- No. 5. Indigestion, June 3 to 7; diarrhea, June 19 and 20; diarrhea, September 13 to 16; diarrhea, October 10 to 12.
- No. 6. Dysentery, June 6 to 10.
- No. 7. Dysentery, June 14 to 17.
- No. 8. Indigestion, June 16 to 18.
- No. 9. Diarrhea, June 17 to 21; gastritis, September 30 to October 19.
- No. 10. Diarrhea, June 20 to 23.
- No. 11. Indigestion, June 21 to 24.
- No. 12. Indigestion, July 11 and 12.
- No. 13. Diarrhea, July 12 to 14.
- No. 14. Diarrhea, July 25 and 26.
- No. 15. Diarrhea, August 5 and 6.
- No. 16. Indigestion, August 5 and 6.
- No. 17. Diarrhea, August 15 to 17.
- No. 18. Indigestion, August 18 and 19; indigestion, September 16 and 17.
- No. 19. Diarrhea, August 25 and 26; diarrhea, September 3 and 4.
- No. 20. Diarrhea, August 25 to 28; gastritis, September 15 to 17; indigestion, September 30 to October 6.
- No. 21. Indigestion, August 25 and 26.
- No. 22. Diarrhea, August 26 to 28.
- No. 23. Diarrhea, August 28 to 31; indigestion, September 13 to 16.
- No. 24. Indigestion, September 1 to 3.
- No. 25. Diarrhea, September 3 and 4.
- No. 26. Gastritis, September 8 to 10; indigestion, September 18 and 19.
- No. 27. Diarrhea, September 6 and 7.
- No. 28. Gastro-enteritis, September 6 to 11.
- No. 29. Indigestion, September 12 to 18.
- No. 30. Indigestion, September 12 and 13; gastritis, October 15 to 17.
- No. 31. Gastritis, September 15 to 25.
- No. 32. Gastro-enteritis, September 19 and 20.
- No. 33. Indigestion, September 26 to 30.
- No. 34. Indigestion, September 28 to 30.
- No. 35. Diarrhea, September 29 and 30.
- No. 36. Dysentery, September 29 and 30.
- No. 37. Gastritis, September 30 to October 19.
- No. 38. Diarrhea, October 5 and 6.
- No. 39. Indigestion, October 12 and 13; indigestion, October 14 and 15.
- No. 40. Indigestion, October 12 and 13.
- No. 41. Indigestion, October 22 and 23.

Company G.

- No. 1. Gastro-enteritis, June 1 to 10; indigestion, July 1 to 7.
- No. 2. Indigestion, June 8 to 25; indigestion, July 10 to 12; indigestion, August 24 and 25; gastritis, September 7 to 9; indigestion, September 28 to 30; indigestion, October 29 and 30.
- No. 3. Gastro-enteritis, June 12 to 18.
- No. 4. Gastro-enteritis, June 16 to 22.

- No. 5. Dysentery, June 17 to 20.
- No. 6. Gastro-enteritis, June 18 to 26.
- No. 7. Indigestion, June 20 to 22.
- No. 8. Dysentery, June 20 to 30.
- No. 9. Diarrhea, June 21 to 26; diarrhea, June 29 to July 2; diarrhea, August 12 to 14; indigestion, August 16 to 19; indigestion, September 3 and 4; indigestion, September 12 to 14; indigestion, September 26 and 27; indigestion, October 6 to 9.
- No. 10. Indigestion, June 25 to 28.
- No. 11. Indigestion, June 25 to 28; indigestion, June 11 and 12.
- No. 12. Indigestion, June 26 to 30; malaria, September 13 to 21; jaundice, September 23 to 29.
- No. 13. Diarrhea, June 29 to July 1; indigestion, July 5 to 7; indigestion, September 22 and 23; indigestion, October 26 to 28.
- No. 14. Diarrhea, June 30 to July 2; diarrhea, July 9 to 12.
- No. 15. Dysentery, July 7 to 12.
- No. 16. Indigestion, July 10 and 11.
- No. 17. Diarrhea, July 11 to 13.
- No. 18. Diarrhea, July 11 to 14; malaria, August 26 to September 10.
- No. 19. Indigestion, July 29 and 30.
- No. 20. Indigestion, August 11 to 18.
- No. 21. Indigestion, August 11 to 13.
- No. 22. Indigestion, August 10 to 14; gastritis, September 30 to October 4; diarrhea, October 13 and 14.
- No. 23. Indigestion, August 14 to 16; indigestion, September 20 and 21; indigestion, September 27 and 28; indigestion, October 13 and 14.
- No. 24. Indigestion, August 16 to 28.
- No. 25. Diarrhea, August 17 to 19; diarrhea, September 13 to 16.
- No. 26. Indigestion, August 26 and 27.
- No. 27. Indigestion, August 9 to September 2; indigestion, September 13 to 16.
- No. 28. Indigestion, August 31 to September 2.
- No. 29. Indigestion, August 31 to September 1.
- No. 30. Diarrhea, September 1 to 4.
- No. 31. Indigestion, September 2 to 4; indigestion, September 26 and 27.
- No. 32. Indigestion, September 7 and 8.
- No. 33. Gastritis, September 8 to 10.
- No. 34. Indigestion, September 12 and 13.
- No. 35. Gastro-enteritis, September 12 to 16.
- No. 36. Gastritis, September 13 to 15.
- No. 37. Gastritis, September 15 to 29.
- No. 38. Gastro-enteritis, September 20 to 25; diarrhea, September 26 to October 1.
- No. 39. Indigestion, September 24 and 25.
- No. 40. Indigestion, September 24 and 25.
- No. 41. Indigestion, September 26 to 28.
- No. 42. Gastritis, September 11. This diagnosis was changed to malaria, and the patient was sent to the division hospital September 29. Here the diagnosis was changed to typhoid fever.
- No. 43. Indigestion, October 3 and 4.
- No. 44. Gastritis, October 3 to 5.
- No. 45. Gastritis, October 3 to 19.
- No. 46. Gastritis, October 7 to 9.
- No. 47. Indigestion, October 11 and 12.
- No. 48. Indigestion, October 13 and 14.

Company H.

- No. 1. Diarrhea, June 2 to 5; gastro-enteritis, July 28 to August 1.
- No. 2. Diarrhea, June 5 to 7.
- No. 3. Indigestion, June 5 to 8; malaria, September 12 to 21.
- No. 4. Indigestion, June 5 to 8; malaria, September 5 to 10; gastritis, September 13 to 16; gastritis, October 16 to 21.
- No. 5. Dysentery, June 9 to 15.
- No. 6. Indigestion, June 12 to 18.

- No. 7. Indigestion, June 14 to 18; diarrhea, August 26 to 29.
- No. 8. Dysentery, June 15 to 19; gastric catarrh, October 24 to 31.
- No. 9. Diarrhea, June 15 to 17.
- No. 10. Indigestion, June 17 to 20; diarrhea, September 2 and 3.
- No. 11. Indigestion, June 17 to 19; gastritis, September 12 to 15.
- No. 12. Indigestion, June 19 to 21.
- No. 13. Indigestion, June 21 to 23.
- No. 14. Dysentery, June 26 to 28.
- No. 15. Indigestion, June 15; sent to division hospital June 18; returned to duty July 4.
- No. 16. Indigestion, June 29 to July 1.
- No. 17. Indigestion, July 1 to 3; indigestion, October 4 to 8.
- No. 18. Indigestion, July 16 to 18.
- No. 19. Diarrhea, August 2 to 4.
- No. 20. Diarrhea, August 5 and 6.
- No. 21. Diarrhea, August 8 to 15.
- No. 22. Diarrhea, August 11 to 13; gastritis, October 5 to 9.
- No. 23. Diarrhea, August 13 to 17.
- No. 24. Diarrhea, August 14 to 19; indigestion, October 14 to 16.
- No. 25. Indigestion, August 15 to 20; diarrhea, August 29 to September 16.
- No. 26. Indigestion, August 15 to 17.
- No. 27. Indigestion, August 18 and 19.
- No. 28. Indigestion, August 18 and 19; indigestion, October 10 to 13.
- No. 29. Indigestion, August 19 and 20.
- No. 30. Diarrhea, August 30; sent to division hospital September 4, where the disease was diagnosed as typhoid fever.
- No. 31. Diarrhea, August 30 to September 4.
- No. 32. Dysentery, August 31 to September 2; gastro-enteritis, September 25 to October 13.
- No. 33. Indigestion, September 14 and 15.
- No. 34. Gastritis, September 15 to 17.
- No. 35. Diarrhea, September 20 and 21.
- No. 36. Indigestion, September 21 and 22.
- No. 37. Gastritis, September 30 to October 1.
- No. 38. Indigestion, October 1 to 3.
- No. 39. Indigestion, October 10 to 13.
- No. 40. Diarrhea, October 11 to 13.
- No. 41. Gastritis, October 19 and 20.

Company I.

- No. 1. Indigestion, June 1 to 3.
- No. 2. Dysentery, June 2 and 3; malaria, September 12 to 15; indigestion, September 29 to October 7.
- No. 3. Dysentery, June 2 to 4.
- No. 4. Dysentery, June 3 to 9; indigestion, June 22 to 26; diarrhea, August 18 and 19; gastritis, October 3 to 9; indigestion, October 11 and 13.
- No. 5. Dysentery, June 3 to 11; indigestion, June 12 and 13; malaria, August 8 to 15.
- No. 6. Indigestion, June 4 to 6.
- No. 7. Indigestion, June 4 to 8; gastritis, September 6 to 8.
- No. 8. Indigestion, June 7 to 9; diarrhea, July 28 to 30; indigestion, August 25 and 26.
- No. 9. Indigestion, June 7 to 9; diarrhea, September 25 to 29.
- No. 10. Indigestion, June 7 to 10; Malaria September 12 to 19.
- No. 11. Dysentery, June 10 to 17.
- No. 12. Dysentery, June 18 to 21; malaria, August 31; sent to division hospital September 8; returned to sick quarters September 9; returned to division hospital September 24.
- No. 13. Diarrhea, June 18 to 23; malaria, September 13; sent to division hospital September 14; here diagnosed as typhoid fever.
- No. 14. Indigestion, June 20 to 22; malaria, September 5 to 9.
- No. 15. Indigestion, June 21 to 23.
- No. 16. Indigestion, June 22 to 25.

No. 17. Indigestion, June 23 to 26; diarrhea, July 13; malaria, August 30 to September 3.

No. 18. Diarrhea, June 24 to 27; indigestion, August 1 to 21; malaria, August 31.

No. 19. Indigestion, June 30; diarrhea, August 13 and 14; indigestion, August 15 to 20; indigestion, August 23 to 25; indigestion, September 18 and 19; indigestion, October 7 to 9; gastritis, October 11 to 21.

No. 20. Indigestion, July 4 to 7; malaria, September 4 to 16; diarrhea, October 3 to 11.

No. 21. Dysentery, July 5 to 9.

No. 22. Enteritis, July 13 to 20.

No. 23. Indigestion, July 14 to 16.

No. 24. Gastro-enteritis, August 3 to 14.

No. 25. Diarrhea, August 4 to 22; gastro-enteritis, September 19 to 24; gastro-enteritis, September 28 to October 3.

No. 26. Indigestion, August 5 and 6; malaria, September 12 to 19.

No. 27. Indigestion, August 5 and 6; indigestion, October 10 to 13.

No. 28. Diarrhea, August 8 to 19.

No. 29. Indigestion, August 12 to 20; indigestion, September 19 and 20.

No. 30. Indigestion, August 15 to 18; indigestion, September 19 to 23; gastritis, September 27 to October 13.

No. 31. Dysentery, August 19 and 20.

No. 32. Diarrhea, August 23 to 28.

No. 33. Diarrhea, August 24 to 26; gastritis, September 20 to 22.

No. 34. Indigestion, August 25 and 26.

No. 35. Indigestion, August 30 and 31; indigestion, September 26 and 27.

No. 36. Gastritis, August 16 to September 26.

No. 37. Gastro-enteritis, September 1 to 5; indigestion, October 7 and 8.

No. 38. Indigestion, September 1 and 2; malaria, September 8; sent to division hospital September 11; here diagnosed as typhoid fever.

No. 39. Diarrhea, September 2 to 4.

No. 40. Indigestion, September 6 and 7.

No. 41. Diarrhea, September 8 and 9; gastritis, September 9 to 12.

No. 42. Diarrhea, September 8 and 9; malaria, September 13; sent to division hospital September 19; here diagnosed as typhoid fever.

No. 43. Gastritis, September 12 to 16.

No. 44. Indigestion, September 16 and 17.

No. 45. Diarrhea, September 17 to 20.

No. 46. Indigestion, September 22 and 23.

No. 47. Gastro-enteritis, September 26 and 27; diarrhea, September 28 to October 11.

No. 48. Gastro-enteritis, September 28 to October 4.

No. 49. Gastritis, September 26 to October 19.

No. 50. Gastritis, October 2 to 8.

No. 51. Gastritis, October 3 to 9.

No. 52. Diarrhea, October 3 and 4.

No. 53. Indigestion, October 4 and 5.

No. 54. Indigestion, October 5 and 6.

No. 55. Indigestion, October 6 to 8.

No. 56. Indigestion, October 10 to 17.

No. 57. Indigestion, October 13 and 14.

No. 58. Indigestion, October 17 to 19.

No. 59. Diarrhea, October 17 to 19.

Company K.

No. 1. Indigestion, May 26 and 27.

No. 2. Indigestion, June 1 to 6.

No. 3. Gastro-enteritis, June 4 to 11; indigestion, June 20 to 23; indigestion, September 6 and 7; malaria, September 28. Incomplete.

No. 4. Indigestion, June 5 to 7; malaria, September 28. Incomplete.

No. 5. Indigestion, June 5 to 8.

No. 6. Indigestion, June 8 to 10.

No. 7. Gastro-enteritis, June 11 to 18; indigestion, October 7 to 9.

No. 8. Indigestion, June 22 to 24; indigestion, October 7 and 8.

No. 9. Indigestion, June 29 to July 6.

No. 10. Gastro-enteritis, July 1 to 10; indigestion, September 6 to 9; gastritis, September 20 to 24.

No. 11. Indigestion, July 1 and 2; malaria, September 5 to 9; indigestion, September 13 and 14.

No. 12. Indigestion, July 2 to 6; indigestion, August 16 and 17; diarrhea, September 7 to 9; malaria, September 20 to 25.

No. 13. Indigestion, July 12 and 13; diarrhea, August 24 to 28.

No. 14. Indigestion, July 12 and 13; diarrhea, August 16 to 18.

No. 15. Indigestion, July 12 and 13.

No. 16. Gastro-enteritis, July 12 to August 6; malaria, August 11; furloughed September 9.

No. 17. Diarrhea, August 2 to 4; indigestion, August 18 and 19; diarrhea, August 6 to 9.

No. 18. Diarrhea, August 3 and 4; diarrhea, August 24 to 28; indigestion, September 6 to 9; gastritis, September 10 and 11; diarrhea, September 28 and 29.

No. 19. Diarrhea, August 5 and 6; malaria, September 6; sent to division hospital September 17.

No. 20. Diarrhea, August 13 and 14.

No. 21. Diarrhea, August 16 to 22.

No. 22. Indigestion, August 16 to 18; gastro-enteritis, September 20 to 28.

No. 23. Diarrhea, August 10 to 21.

No. 24. Indigestion, August 20 to 23.

No. 25. Indigestion, August 24 to 28; gastritis, September 30 to October 13.

No. 26. Diarrhea, August 30 and 31; gastritis, October 26 to 31.

No. 27. Diarrhea, August 30 and 31; indigestion, October 7 to 9.

No. 28. Indigestion, August 28 to September 15; gastritis, September 19 to 24.

No. 29. Diarrhea, August 30 to September 2.

No. 30. Gastritis, September 12 to 16; diarrhea, September 28 to 30; indigestion, October 6 to 8.

No. 31. Indigestion, September 12 to 14.

No. 32. Indigestion, September 17 to 22.

No. 33. Indigestion, September 17 to 19.

No. 34. Diarrhea, September 19 to 24.

No. 35. Indigestion, September 21 and 22.

No. 36. Gastritis, September 23 to 26.

No. 37. Indigestion, September 28 and 29.

No. 38. Gastro-enteritis, September 19; sent to division hospital September 23.

No. 39. Indigestion, October 7 and 8.

No. 40. Diarrhea, October 7 to 10.

Company L.

No. 1. Indigestion, May 29 and 30.

No. 2. Indigestion, June 1 to July 4.

No. 3. Gastro-enteritis, June 6 to 10.

No. 4. Indigestion, June 6 to 8.

No. 5. Indigestion, June 7 to 10; indigestion, August 18 to 23; malaria, August 28 to September 2.

No. 6. Indigestion, September 9 to 15; indigestion, October 1 and 2.

No. 7. Indigestion, June 13 to 15.

No. 8. Indigestion, June 14 to 19.

No. 9. Indigestion, June 16 to 18.

No. 10. Indigestion, June 20 to 23; diarrhea, August 13 and 14.

No. 11. Indigestion, June 22 to 25.

No. 12. Indigestion, June 22 to 25.

No. 13. Indigestion, June 23 to 25; indigestion, August 23 and 24.

- No. 14. Indigestion, June 28 to 30; malaria, September 19 to 21; malaria, September 26 to October 13.
 No. 15. Indigestion, July 1 to 9.
 No. 16. Gastro-enteritis, July 5 to 10.
 No. 17. Diarrhea, July 16 to 19.
 No. 18. Diarrhea, August 15 and 16; diarrhea, September 23 to 25.
 No. 19. Diarrhea, August 17 to 19; gastro-enteritis, September 28; division hospital, September 30 to October 9.
 No. 20. Indigestion, August 18 and 19; malaria, September 2 to 14.
 No. 21. Indigestion, August 19 to 23; typhoid fever, September 24; sent to division hospital September 28.
 No. 22. Diarrhea, August 23 and 24.
 No. 23. Diarrhea, August 23 and 24; diarrhea, September 2 to 4; malaria, September 12 to 26; typhoid fever, October 11; sent to division hospital October 14.
 No. 24. Diarrhea, August 25 to 28.
 No. 25. Undetermined, August 19.
 No. 26. Diarrhea, September 1 to 4.
 No. 27. Diarrhea, September 1 and 2.
 No. 28. Gastritis, September 9 to 11.
 No. 29. Diarrhea, September 9 to 11; diarrhea, September 28 to 30.
 No. 30. Diarrhea, September 14 to 16.
 No. 31. Gastro-enteritis, September 14 to 19; gastritis, September 25 to 27.
 No. 32. Indigestion, September 15 and 16.
 No. 33. Diarrhea, September 15 to 19.
 No. 34. Diarrhea, September 21 and 22.
 No. 35. Indigestion, September 21 and 22.
 No. 36. Gastro-enteritis, September 23 to 28.
 No. 37. Indigestion, September 28 and 29; malaria, October 3; sent to division hospital October 12.
 No. 38. Diarrhea, September 29 and 30.
 No. 39. Diarrhea, September 19 to October 30.
 No. 40. Dysentery, October 6 to 10.
 No. 41. Diarrhea, October 10 to 13.

Company M.

- No. 1. Cholera morbus, May 31 to June 5; gastro-enteritis, July 9 to 13; gastritis, August 4 to 6.
 No. 2. Dysentery, June 4 to 11.
 No. 3. Dysentery, June 6 to 14; diarrhea, August 30; sent to division hospital September 19.
 No. 4. Indigestion, June 8 to 20.
 No. 5. Dysentery, June 9 to 12.
 No. 6. Indigestion, June 11 to 13; gastritis, September 22 to 26.
 No. 7. Indigestion, June 13 to 16.
 No. 8. Indigestion, June 16 to 18; indigestion, August 12 and 13; malaria, August 15; sent to division hospital August 19; sent to Sternberg Hospital August 25.
 No. 9. Indigestion, June 18 to 20.
 No. 10. Indigestion, June 18 to 21.
 No. 11. Dysentery, June 20 to 22.
 No. 12. Dysentery, June 22 to 26.
 No. 13. Dysentery, June 22 to 28; diarrhea, September 15 and 16.
 No. 14. Dysentery, June 22 to 28; diarrhea, September 21 to 26.
 No. 15. Dysentery, June 22 to 28.
 No. 16. Dysentery, June 24 to 28.
 No. 17. Indigestion, June 22 to 29.
 No. 18. Indigestion, June 27 to 30; indigestion, September 15 and 16.
 No. 19. Indigestion, July 5 to 8.
 No. 20. Diarrhea, July 10 to 13; indigestion, August 29 to 31.
 No. 21. Diarrhea, July 12 to 15.
 No. 22. Indigestion, July 12 to 23; malaria, September 3 to 7; malaria, September 16 to 23.
 No. 23. Dysentery, July 12 to 17.

- No. 24. Dysentery, July 13 to 18; malaria, September 7; sent to division hospital September 11.
 No. 25. Diarrhea, July 25 and 26.
 No. 26. Diarrhea, August 5 and 6.
 No. 27. Indigestion, August 10 to 17.
 No. 28. Indigestion, August 11 to 13.
 No. 29. Indigestion, August 17 and 18.
 No. 30. Indigestion, August 18 and 19.
 No. 31. Indigestion, August 20 and 21; indigestion, September 23 to 25.
 No. 32. Indigestion, August 20 to 28; malaria, September 12 to 19; malaria, September 24 to 26.
 No. 33. Diarrhea, August 25 and 26; malaria, August 30 to September 4; malaria, October 6 to 8.
 No. 34. Diarrhea, August 25 to 28; diarrhea, September 23 to 25.
 No. 35. Indigestion, August 30 and 31.
 No. 36. Diarrhea, September 1 to 4.
 No. 37. Diarrhea, September 3 to 6.
 No. 38. Dysentery, September 7; died, September 20.
 No. 39. Diarrhea, September 10 to 15.
 No. 40. Diarrhea, September 14 to 18.
 No. 41. Indigestion, September 15 and 16.
 No. 42. Indigestion, September 19 and 20.
 No. 43. Gastritis, September 19 to 23.
 No. 44. Gastritis, September 19 to 21.
 No. 45. Gastro-enteritis, September 19 to 26.
 No. 46. Gastro-enteritis, September 19 to 26.
 No. 47. Gastritis, September 22 to 26.
 No. 48. Indigestion, September 24 and 25.
 No. 49. Gastritis, September 28 to October 2.
 No. 50. Diarrhea, October 6 to 8.
 No. 51. Diarrhea, October 28 and 29.
 No. 52. Indigestion, October 30.

We will now proceed to make a few comments on the cases included in the above lists. In order to render reference more easy we will refer to these cases by companies. In the list from Company A the possible cases of typhoid fever are Nos. 4, 6, 8, 17, 38, 41, 45, 46, 51, 54, and 58—11 in all. In cases 38, 45, 46, 51, and 58—if these were cases of typhoid fever—there was no intestinal disorder preceding the typhoid fever. This reduces the number of possible typhoids preceded by intestinal disturbances to 6. Altogether there were 23 probable typhoid cases in this company, and our conclusion, reached in the study of other regiments, that the majority of typhoid fevers were not preceded by intestinal disorders, is again confirmed. The same result may be stated in the following way:

We will suppose that the company had its full quota, 106 men. Fifty-nine of these had some intestinal disorder, which was followed by typhoid fever in 6 individuals, while the 47 men who are not reported as having suffered from any intestinal disorder furnished 18 cases of typhoid fever. In the case of No. 8 the preceding intestinal disorders were most probably developed after the date of the typhoid-fever infection, and should be considered as really a part of the typhoid fever.

In the list from Company B, Nos. 7, 9, 12, 14, 15, 16, 19, 22, 23, 33, 36, and 46—12 in all—were probable cases of typhoid fever. In No. 46 the typhoid fever was not preceded by any intestinal disorder.

Altogether there were in this company 25 cases of probable typhoid fever. Suppose that this company had its full strength, 106 men, then 56 men who had some preceding intestinal disorder developed 11 cases of typhoid fever, and 50 men who had no preceding intestinal disorder developed 14 cases of typhoid fever.

In the list from Company C cases Nos. 10, 18, 19, 20, 26, 28, 29, 35, and 40—9 in all—are possible cases of typhoid fever. In cases Nos. 18, 19, 20, 28, 29, 35, and 40 there were no preceding intestinal disorders. This leaves only two cases that were preceded by recorded intestinal trouble. Altogether there were 24 probable typhoid cases in Company C, therefore two of the cases of typhoid fever were preceded by some intestinal disorder, while 22 cases were not.

In the list from Company D, Nos. 1, 2, 6, 35, 44, and 51—6 in all—were probable cases of typhoid fever. In Nos. 35 and 51 there was no preceding intestinal trouble; in No. 44 the preceding indigestion was most likely a part of the typhoid fever. In No. 1 this was probably the case. This leaves in all 2 cases (Nos. 2 and 6) in which typhoid fever was preceded by some intestinal disorder. Altogether in Company D there were 22 cases of probable typhoid fever in all, 2 of which were preceded by some intestinal disorder.

In Company E, cases Nos. 5, 10, 39, and 42—4 in all—were probable typhoids. In No. 42 there was no preceding intestinal disorder. Altogether there were in Company E 14 cases of probable typhoid fever. Three of these were preceded by some recorded intestinal disorder and 11 were not.

In the list from Company F, Nos. 9 and 37 are the only probable cases of typhoid fever. In No. 37 there was no preceding intestinal disorder. Altogether there were in Company F 12 cases of probable typhoid fever. Only one of these was preceded by some intestinal disorder.

In Company G, cases Nos. 2, 18, 27, 38, 42, and 45—6 in all—were possibly typhoids. Only one of these (No. 18) was preceded by a recognized intestinal disturbance. Altogether there were 25 cases of probable typhoid fever in this company, and only 1 of these was preceded by any intestinal disorder.

In Company H, cases Nos. 15, 25, 30, 32—4 in all—were probable typhoids. Nos. 15 and 30 were not preceded by any intestinal disorder. Altogether there were 16 cases of probable typhoids in this company, and only 2 of these were preceded by a recorded intestinal disease.

In Company I, cases Nos. 12, 13, 18, 24, 25, 30, 36, 38, 42, 47, and 49—11 in all—were probable typhoids. Nos. 24, 25, 36, 38, 42, 47, and 49, were not preceded by any intestinal diseases. Altogether there were 27 cases of probable typhoid fever in this company, and only 4 of these were preceded by recorded intestinal disorder.

In the list from Company K, cases Nos. 16, 25, 28, and 38—4 in all—are probable typhoids. Nos. 16, 28, and 38 were not preceded by intestinal diseases. Altogether there were 25 probable typhoids in this company, only 1 of which was preceded by any recognized intestinal disturbances.

In the list from Company L, cases Nos. 2, 14, 19, 21, 23, 37, and 39—7 in all—were probable typhoids. Nos. 2 and 39 were not preceded by any recorded intestinal disorder. In Nos. 23 and 37 the preceding intestinal diseases were most likely a part of the typhoidal process. This reduces the number of typhoid cases preceded by intestinal disorder in this company to 3. Altogether there were in Company L 26 cases of probable typhoid fever, 23 of which were not preceded by any intestinal disorder.

In the list from Company M, cases Nos. 3, 8, 24, and 38—4 in all—were probable typhoids. No. 38 was not preceded by any intestinal disorder. Altogether there were 12 probable typhoid cases in Company M, and only 3 of these were preceded by recognized intestinal disturbances.

We will now give a general summary for the regiment, so far as the relation between preceding intestinal disorders and typhoid fever is concerned.

There were 260 cases of probable typhoid fever in this regiment. Five of these had the initial date of their illness in November, and 4 others do not belong to any company. Deducting these, the 12 companies furnish 251 cases of typhoid fever.

Supposing that each company had its full quota of 106 enlisted men and 3 commissioned officers; then 1,308 men furnished 251 cases of typhoid fever. Five hundred and eighty-five individuals are reported as having had some intestinal disorder, and apparently 723 escaped diseases of this kind. The 585 persons furnished 82 cases of typhoid fever—1 to 7.13. The 723 individuals furnished 169 cases of typhoid fever—1 to 4.6. However, these figures do not represent the facts. Of the 82 cases of typhoid fever, 42 were not preceded by any intestinal disorder; therefore, 543 persons who had intestinal disorders of some kind, furnished 40 cases of typhoid fever—1 to 13.7; and 765 persons, who had no intestinal disorders, furnished 211 cases of typhoid fever—1 to 3.64. A little more than 84 per cent of the typhoid fevers in this regiment were not preceded by any intestinal disorder. It seems to us that only one conclusion can be drawn from these facts. Many of the diarrheas must have been due to or, at least, accompanied by a typhoidal infection.

The diagnosis of malaria does not occur in the sick reports from this regiment until the month of August. During this month 108 cases are recorded as malaria. This disease is always designated in these reports as remittent. The following is a complete list of the malarias reported in this regiment:

Company A.

- No. 1. Malaria, August 10 to 16.
- No. 2. Malaria, August 16; sent to division hospital August 19; sent to Sternberg Hospital August 27; sick October 31.
- No. 3. Malaria, August 18 to 20.
- No. 4. Malaria, August 19 to 21; malaria, September 7; sent to division hospital September 11; furloughed October 15.
- No. 5. Malaria, August 23 to 25.
- No. 6. Malaria, July 31 to October 15.
- No. 7. Malaria, September 1 to 14.
- No. 8. Malaria, September 4 to 28.
- No. 9. Malaria, September 7 to 17.
- No. 10. Malaria, September 17 to 21.
- No. 11. Malaria, September 1; sent to division hospital September 12; here the disease was diagnosed typhoid fever.

Company B.

- No. 1. Malaria, August 11 to 22.
- No. 2. Malaria, August 18 to 21.
- No. 3. Malaria, August 23 to 28; malaria, August 11; furloughed August 25; hospital diagnosis, typhoid fever.
- No. 4. Malaria, August 17; furloughed August 25; hospital diagnosis, typhoid fever.
- No. 5. Malaria, August 30; sent to division hospital September 1; hospital diagnosis, typhoid fever.
- No. 6. Malaria, October 25; sent to division hospital October 24; sick October 31.
- No. 7. Malaria, September 17 and 18.

Company C.

- No. 1. Malaria, September 2 to 13.
- No. 2. Malaria, September 2 to 17.
- No. 3. Malaria, September 2 to 12.
- No. 4. Malaria, September 3 to 9.
- No. 5. Malaria, September 5 to 14.
- No. 6. Malaria, September 19 to 25.
- No. 7. Malaria, September 5; sent to division hospital September 11. This was a relapse, the initial day of typhoid being July 9.
- No. 8. Malaria, September 12; sent to division hospital September 15; duty, October 7.
- No. 9. Malaria, September 12; sent to division hospital September 12; hospital diagnosis, typhoid fever.
- No. 10. Malaria, August 8; sent to division hospital August 10; returned to duty October 1.
- No. 11. Malaria, September 5; sent to division hospital September 9; discharged October 15.
- No. 12. Malaria, September 29 to October 2.
- No. 13. Malaria, September 6; sent to division hospital September 9; furloughed November 8.
- No. 14. Malaria, August 6; sent to division hospital September 11; this was a relapse; initial date of typhoid was July 2.
- No. 15. Malaria, September 14; sent to division hospital September 15; hospital diagnosis, typhoid fever.
- No. 16. Malaria, September 15; sent to division hospital September 19; hospital diagnosis, typhoid fever.
- No. 17. Malaria, September 15; sent to division hospital September 17; hospital diagnosis, typhoid fever.

Company D.

- No. 1. Malaria, August 11; sent to division hospital August 19; sent to Sternberg Hospital August 25.
- No. 2. Malaria, August 14 to 16.
- No. 3. Malaria, August 18 to 25.
- No. 4. Malaria, August 23 and 24.

No. 5. Malaria, August 24 to 28.

- No. 6. Malaria, August 8; sent to division hospital August 10; furloughed August 25; hospital diagnosis, typhoid fever.
- No. 7. Malaria, August 31 to September 1.
- No. 8. Malaria, September 4 to 14.
- No. 9. Malaria, September 1 to 5.
- No. 10. Malaria, September 5 to 16.
- No. 11. Malaria, September 6 to 22.
- No. 12. Malaria, September 14 to 21.
- No. 13. Malaria, September 14 to 20.
- No. 14. Malaria, September 18 and 19.

Company E.

- No. 1. Malaria, August 11; sent to division hospital August 19; sent to Sternberg Hospital August 25.
- No. 2. Malaria, August 13 to 18.
- No. 3. Malaria, August 22 to 28.
- No. 4. Malaria, August 22 to 29.
- No. 5. Malaria, August 24 to 28.
- No. 6. Malaria, August 25 to 28.
- No. 7. Malaria, August 26 and 27.
- No. 8. Malaria, August 28; sent to division hospital August 30; returned to duty September 19.
- No. 9. Malaria, August 28 to September 9.
- No. 10. Malaria, September 7 to 10.
- No. 11. Malaria, September 16 to 20.
- No. 12. Malaria, September 17 and 18.
- No. 13. Malaria, September 3; sent to division hospital September 9.
- No. 14. Malaria, September 3; division hospital September 11; diagnosis, typhoid fever.

Company F.

- No. 1. Malaria, August 4 to 11; malaria, August 12 to 18.
- No. 2. Malaria, August 12 to 18.
- No. 3. Malaria, August 22 to 25.
- No. 4. Malaria, August 23; sent to Sternberg Hospital August 25; hospital diagnosis, typhoid fever; furloughed, October 14.
- No. 5. Malaria, August 25 to 28; malaria, September 3 to 12.
- No. 6. Malaria, August 24 to 28.
- No. 7. Malaria, August 24 to 26.
- No. 8. Malaria, September 1 to 12.
- No. 9. Malaria, September 6 to 14.
- No. 10. Malaria, September 11 to 16.
- No. 11. Malaria, September 14 to 25.
- No. 12. Malaria, September 15 to 17.
- No. 13. Malaria, September 7; sent to division hospital September 11; hospital diagnosis, typhoid fever; furloughed October 14.
- No. 14. Malaria, October 18 and 19.

Company G.

- No. 1. Malaria, August 23; sent to Sternberg Hospital August 25; furloughed October 9.
- No. 2. Malaria, August 24 to 28; malaria, September 6 to 10.
- No. 3. Malaria, August 16; furloughed August 27; duty October 19.
- No. 4. Malaria, August 22; furloughed September 27.
- No. 5. Malaria, August 24 to September 4.
- No. 6. Malaria, August 31 to September 13.
- No. 7. Malaria, September 6 to 10; malaria, September 13 to 18.
- No. 8. Malaria, September 22 to 25.
- No. 9. Malaria, September 28 to October 19.
- No. 10. Malaria, September 7; sent to division hospital September 11; hospital diagnosis, typhoid fever; furloughed October 17.

Company H.

- No. 1. Malaria, August 12 to 20.
- No. 2. Malaria, August 14; sent to division hospital August 18; sent to Sternberg Hospital August 25; hospital diagnosis, typhoid fever.
- No. 3. Malaria, August 29; sent to division hospital August 31; returned to sick quarters September 14; returned to duty September 18.
- No. 4. Malaria, September 3 to 9.
- No. 5. Malaria, September 9 to 17.
- No. 6. Malaria, September 11 to 16.
- No. 7. Malaria, September 13 to 24.
- No. 8. Malaria, September 13 to 21.
- No. 9. Malaria, August 1; sent to division hospital August 5; returned to sick quarters August 14; returned to duty October 13.
- No. 10. Malaria, August 31; sent to division hospital September 6.
- No. 11. Malaria, September 16; sent to division hospital September 20; hospital diagnosis, typhoid fever.

Company I.

- No. 1. Malaria, August 16; sent to division hospital August 18; sent to Sternberg Hospital August 25; died September 6.
- No. 2. Malaria, August 17; sent to division hospital August 18; sent to Sternberg Hospital August 25; furloughed September 9.
- No. 3. Malaria, August 20 to 23; malaria, September 11 to 16; malaria, September 30 to October 7.
- No. 4. Malaria, August 23 to 28; malaria, September 10 to 18.
- No. 5. Malaria, August 16 to September 26.
- No. 6. Malaria, August 24 to October 10.
- No. 7. Malaria, August 29 to September 3.
- No. 8. Malaria, August 30; sent to division hospital September 12.
- No. 9. Malaria, September 2 to 4; malaria, September 10. Sent to division hospital September 15; returned to duty October 21.
- No. 10. Malaria, September 3; sent to division hospital September 13; returned to duty September 20.
- No. 11. Malaria, September 13 to 25.
- No. 12. Malaria, September 19 to 21; malaria, September 22 to 25.
- No. 13. Malaria, July 31; furloughed August 21; returned to sick quarters September 28.
- No. 14. Malaria, September 2; sent to division hospital September 8; hospital diagnosis, typhoid fever.
- No. 15. Malaria, September 8; sent to division hospital September 11; hospital diagnosis, typhoid fever.
- No. 16. Malaria, September 13; sent to division hospital September 15; hospital diagnosis, typhoid fever.
- No. 17. Malaria, September 17; sent to division hospital September 19; sick October 31.

Company K.

- No. 1. Malaria, August 9 to 19.
- No. 2. Malaria, August 15 and 16.
- No. 3. Malaria, August 24 to 29; malaria, September 12 to 17.
- No. 4. Malaria, August 24; sent to Sternberg Hospital August 25; furloughed September 14.
- No. 5. Malaria, August 25 to 31.
- No. 6. Malaria, August 25 to 30.
- No. 7. Malaria, August 27 to September 16.
- No. 8. Malaria, August 30 to September 30.
- No. 9. Malaria, September 2 to 14.
- No. 10. Malaria, September 14; returned to sick quarters September 26; returned to duty October 10.
- No. 11. Malaria, September 4; sent to division hospital September 5; returned to duty September 26.

- No. 12. Malaria, September 5; sent to division hospital September 12; hospital diagnosis, typhoid fever.
- No. 13. Malaria, September 6; sent to division hospital September 17; hospital diagnosis, typhoid fever.
- No. 14. Malaria, September 10; sent to division hospital September 17; hospital diagnosis, typhoid fever.
- No. 15. Malaria, September 28; sent to division hospital October 25; hospital diagnosis, typhoid fever.
- No. 16. Malaria, September 19; sent to division hospital September 20; duty October 12.
- No. 17. Malaria, October 6; sent to division hospital October 7; hospital diagnosis, typhoid fever.
- No. 18. Malaria, October 9; sent to division hospital October 9; hospital diagnosis, typhoid fever.

Company L.

- No. 1. Malaria, October 2 to 15.
- No. 2. Malaria, August 15 and 16; malaria, September 2 to 4.
- No. 3. Malaria, August 17 to 29.
- No. 4. Malaria, August 17 to 23.
- No. 5. Malaria, August 17 to 23; malaria again, August 24, with no disposition.
- No. 6. Malaria, August 17 to 19.
- No. 7. Malaria, August 23; sent to Sternberg Hospital August 25; furloughed September 17.
- No. 8. Malaria, August 26 to 28.
- No. 9. Malaria, August 11; sent to division hospital August 15; returned to duty September 23.
- No. 10. Malaria, August 22; sent to division hospital August 31; hospital diagnosis, typhoid fever.
- No. 11. Malaria, August 25; sent to division hospital August 31; hospital diagnosis, typhoid fever.
- No. 12. Malaria, September 7; sent to division hospital September 15; returned to duty October 26.
- No. 13. Malaria, September 14; sent to division hospital September 19; hospital diagnosis, typhoid fever.
- No. 14. Malaria, September 19; furloughed October 15.
- No. 15. Malaria, September 28; sent to division hospital October 7; sick October 31.
- No. 16. Malaria, October 10; sent to division hospital October 10; sick October 31.

Company M.

- No. 1. Malaria, August 15; sent to division hospital August 17; sent to Sternberg Hospital August 25; furloughed September 5.
- No. 2. Malaria, August 15 to 21.
- No. 3. Malaria, August 20 to 22.
- No. 4. Malaria, August 24 to 28; malaria, August 30 to September 4.
- No. 5. Malaria, August 12 to September 4.
- No. 6. Malaria, August 30; no disposition.
- No. 7. Malaria, August 31 to September 27.
- No. 8. Malaria, September 8 to 16.
- No. 9. Malaria, September 23 to 27.
- No. 10. Malaria, September 3; sent to division hospital September 5; hospital diagnosis, typhoid fever.
- No. 11. Malaria, September 7; sent to division hospital September 11; furloughed October 17.
- No. 12. Malaria, September 11; sent to division hospital September 14; hospital diagnosis, typhoid fever.

Ninety-three of the above cases were probable typhoids. To this number we must add 26 cases of protracted malaria which were preceded by some intestinal disorder and which are not included in the above list. This gives 119 cases that were diagnosed

by the regimental surgeon as malaria, and whose subsequent history rendered it highly probable that they were cases of typhoid fever.

The following is a summary of the figures concerning typhoid fever in this regiment:

Total number of cases tabulated	260
Number with regimental diagnosis of typhoid fever.....	26
Number with regimental diagnosis of malaria.....	119
Number otherwise diagnosed:	
Diarrhea.....	16
Indigestion	11
Continued fever.....	14
Gastritis or gastro-enteritis.....	29
Dysentery	5
Jaundice.....	1
Number without regimental diagnosis.....	39
Total	260
Number with either regimental or hospital diagnosis of typhoid fever	106
Number with neither regimental nor hospital diagnosis of typhoid fever	154
Total	260

Our tabulated statement shows at least 70 cases of typhoid fever that had their beginning in August. The surgeon's report for this month gives only 3 cases of typhoid fever, and 2 of these were brought over from July. This reduces the number originating in August to 1. The hospital record shows 24 cases of recognized typhoid fever the initial dates of which occur in the month of August. We therefore have three quite diverse statements concerning the number of typhoid fever cases developed in the First West Virginia Infantry during the month of August. The surgeon in charge gives this number as 1. The hospital record places it at 24, and our review of the histories of the sick places it at more than 70. The surgeon in charge of the hospital states that many of the cases reported as malaria in the hospital record were in fact typhoid fever. On September 15 this regiment had 112 patients in the second division hospital and 90 sick in quarters. At that time our committee visited this hospital and the members of our board were satisfied after examining the patients that practically all of them were suffering from typhoid fever. During the same month Professor Dock, well known as an expert diagnostician, studied the cases in this hospital and came to the conclusion that the so-called malarias were typhoid fevers. He examined the blood of 14 of those diagnosed as malaria and failed to find the plasmodium in any of them. These facts convince us that typhoid fever prevailed in this command much more extensively than the figures of the surgeon in charge of the hospital records would indicate. Indeed there are strong reasons that our own estimate is too small. Many men were furloughed home soon after appearing on sick report. Others were furloughed from the division hospital after being there

only a day or two. How many of these men furloughed home early in their illness were really suffering from typhoid fever we can not know.

The distribution of typhoid fever among the companies of this regiment is of interest. Four of the 260 tabulated did not belong to any company. The remaining 256 were distributed among the 12 companies, as follows:

	Cases.		Cases.
Company A	23	Company H	16
Company B	25	Company I	27
Company C	24	Company K	25
Company D	22	Company L	30
Company E	15	Company M	12
Company F	12		
Company G	25	Total.....	256

It will be seen that the distribution among the companies is quite unequal. In our opinion this inequality is sufficiently great to indicate that the spread of the disease could not have been due to causes to which the several companies were simultaneously subjected, but rather to causes that acted upon individuals most intimately associated. The distribution among the companies renders it highly improbable that the general water supply (with the exception of Jay's mill well) of this regiment was at any time infected with typhoid germs. This conclusion is supported by the history of the water supply at the different encampments occupied by this command during the period covered by these reports. We have already considered the water supply at Charleston and at Chickamauga. In regard to that at Knoxville it is sufficient to say that during the time of the occupation in this locality the regiment was supplied with water that was being used simultaneously by several thousand inhabitants of the city, and the health officer of Knoxville assured us, by an inspection of his reports, that typhoid fever did not exist among the citizens at that time. The distribution of the disease in point of time in the several companies confirms our opinion that men living in most direct contact with one another often show the first symptoms of the disease simultaneously. The grouping of cases in some of the companies is quite striking. For instance, the fact that 4 of the 9 cases admitted September 2 belong to Company C is not without significance.

Our study of this regiment practically ends with the month of October; but, as has been stated, 4 cases of typhoid fever are shown by the hospital records to have occurred in November, and it is noteworthy that 3 of these came from the same company and were admitted to the hospital almost simultaneously.

The probabilities are that this regiment became infected at Chickamauga. The first probable case was admitted to sick report June 6, sixteen days after the regiment went in camp at Chickamauga. In our opinion this could hardly have been other than a mild case of typhoid fever, but a diagnosis of indigestion was

made, and the man apparently remained sick in quarters until he was returned to duty July 14. His name is not found on sick report after this date. The records fail to show any suspicious cases earlier than this one.

SUMMARY.

Assembled near Charleston, W. Va., in April, 1898.	
Mustered into United States service about May 10, 1898.	
Arrived at Chickamauga Park, May 20, 1898.	
Strength on arrival, 1,011.	
Date of first case of probable typhoid fever, June 6, 1898.	
Date of first case of recognized typhoid fever, June 16, 1898.	
Left Chickamauga Park, August 26, 1898.	
Strength on departure, 1,298.	
Number of cases of probable typhoid fever developed at Chickamauga	85
Number of cases of probable typhoid fever developed at Knoxville:	
From August 28 to 31	24
During September	122
During October	24
During November	5
Total number of cases of probable typhoid fever reported in the First West Virginia Volunteer Infantry, from May ^a to November, 1898	260
These 260 cases were diagnosed as follows:	
Typhoid fever	106
Malaria	90
Continued fever	12
Gastritis	11
Diarrhea	11
Indigestion	11
Gastro-enteritis	16
Dysentery	3
Total	260

The abatement of typhoid fever during the month of October is much more marked in this command than in some of the other regiments of this division.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Boyce, Lewellyn K...	Corpl., L	1898, Sept. 20	Camp Poland, Tenn.	Typhoid.
Combes, William H...	(?) I.	Sept. 7	Chickamauga, Sternberg U. S. field hospital.	Do.
Gilliam, William L...	Corpl., G.	Nov. 24	Camp Poland, Tenn.	Obstruction of the bowels.
Henretta, William H.	Pvt., M.	Sept. 20	do	Typhoid.
Irwin, Orison	Pvt., I.	Aug. 2	Camp Thomas, Ga.	Chronic diarrhea.
Long, Thomas B	Corpl., D.	Sept. 14	Camp Poland, Tenn.	Appendicitis.
Mills, George G.	Pvt., B.	Nov. 13	do	Typhoid.
Morgan, John H.	Sgt. maj.	Aug. 29	Camp Thomas, Ga.	Do.
Nickel, Arthur C	Pvt., L.	Sept. 8	Camp Poland, Tenn.	Do.
Reid, James A. G.	Pvt., E.	Oct. 3	do	Do.
Russell, James C	Pvt., F.	Nov. 14	do	Do.
Straight, Homer W.	Pvt., D.	Aug. 6	Camp Thomas, Ga.	Malaria.
Taylor, William J	Pvt., I.	Sept. 5	Deerfield, Mass.	Typhoid.
Toothman, Emery B.	Pvt., G.	Sept. 13	Camp Poland, Tenn., second division hospital.	Do.
Tritipoe, Thomas G.	Sgt., I.	Dec. 22	Berkeley Springs, W. Va.	Consumption.
Total deaths				15
Deaths due to typhoid fever				12
Percentage of deaths among cases of probable typhoid fever (260), 4.61.				
Percentage of deaths among cases of recognized typhoid fever (106), 11.32.				

Corrections by Major Baguley.—Gilliam died of typhoid fever with perforation. Straight died of typhoid fever. Long died of obstruction of bowels and not of appendicitis.

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST WEST VIRGINIA VOLUNTEER INFANTRY.

Medical officers.

Henry B. Baguley, major and surgeon, Wheeling, W. Va.
 Charles T. Nesbitt, first lieutenant and assistant surgeon, Fairmont, W. Va.
 Cassius Hogg, first lieutenant and assistant surgeon, Point Pleasant, W. Va.

The following is abstracted from a communication received from Doctor Nesbitt, under date of July 17, 1899:

The site of the regimental camp at Chickamauga Park was covered with underbrush and weeds and was shaded by a thick growth of young trees. The grounds were immediately cleared and the surface fully exposed. The nature of the soil was such as to interfere with the absorption of moisture, and almost immediately beneath the surface a thick stratum of limestone was found. This made the digging of sinks quite difficult, and dynamite had to be employed. The sinks were 10 feet long, 2 feet wide, and 8 feet deep. Orders were issued that each man should cover his deposit of excrement with dry earth, and this order was rigidly enforced. When the sinks were filled within 2 feet of the top they were covered with earth and abandoned. The kitchen sinks were more troublesome, as the soil would not absorb the water that was constantly poured into them. However, in one or two of these sinks the water and much of the refuse from the kitchen disappeared between the fissures in the limestone rock. The sinks were placed at the end of the company streets and above the camp. Frequently after a heavy rain the sinks would overflow and much of their contents would be carried over the adjacent surface. This was always immediately cleaned up and lime sprinkled over the surface. Lime was always used in the sinks when it could be obtained. The water supply was obtained during the first week of our stay at the park from Jay's mill well. However, a rain storm flooded this well and it was immediately abandoned. After this the water was obtained from a spring located about 4 miles east of the camp and hauled to the camp in barrels. Early in August a well was bored inside our guard line, and water from this was used until it was found that the well was being contaminated by drainage from the sinks. Morsels of bread and kitchen waste were pumped from the well. The nearest sink was 100 feet from the well. This well was abandoned and water was again hauled from the spring, as above mentioned. Up to this time but two cases of typhoid fever had developed in the regiment. Both of these were sent to Leiter Hospital and the correctness of the diagnosis was confirmed by the application of the Widal test.

The location of the camp at Knoxville was ideal. The soil is sandy and there is a natural drainage away from the camp in all directions. Floors for the tents were obtained, and shower baths for the men were constructed. The surface of the ground was kept scrupulously clean. Typhoid fever began to develop almost immediately upon our arrival at Knoxville and the cases became alarmingly numerous and continued to be so during the month of September. Eight deaths from this disease occurred during the third week in September. Every precaution that could be taken was used vigorously. The sinks were kept clean and lime was freely used everywhere. The kitchen refuse was hauled away by the neighboring farmers and used as food for hogs, the barrels being emptied daily. The tents were taken down frequently and the floors taken up. Beds and bedding were frequently aired and

sunned. The men were compelled to keep their persons clean. The kitchens and contents were inspected daily by the surgeons. The cooks were carefully instructed in the art of preparing food, and the food was carefully inspected each day. All sick were promptly transferred to the Second Division hospital. From September 1 until December 23 I was acting surgeon of the regiment and can personally answer for the sanitary condition of the camp during that time. The sinks advised by the investigating committee appointed to look into the sanitary condition of the camps were ordered early in October. I had these constructed as soon as possible, but, in my opinion, they were not a success. The solution of lime contained in the tubs did not retain its antiseptic properties for a sufficient length of time, and the tanks had to be scraped in order to remove the accumulated sediment of lime. The men used large pieces of newspaper and these soon accumulated in sufficient quantity to support fecal matter and expose it to flies.^a We had to clean these tanks six and eight times a day. The use of these sinks was continued, however, until the regiment was moved to Columbus, Ga. Here the water supply was obtained from the city waterworks and was excellent.

The regiment was ordered to Columbus, Ga., during the last week in November. The camp at this place was situated in a cotton field, 2 miles north of the city, upon a slightly elevated space. Ditches were immediately dug for drainage throughout the entire camp. Company streets were graded and drained and the camp placed in the best possible condition. The sinks were prepared when the regiment arrived and were quite complete. The pits were so deep that it was not necessary to dig new ones during our stay there. The kitchen sinks were covered with an iron wire grating that separated all solid material from the fluid. The solids were either burned or carried away by the negroes of the neighborhood. The sinks were deodorized and disinfected frequently by the use of crude petroleum and copperas, which were obtained in liberal quantities. The camp was kept scrupulously clean. Beds and tents were aired and sunned as often as the weather permitted. The corral was cleaned daily; the manure was hauled to the adjoining farms.

During the entire period of service of the First West Virginia Volunteer Infantry the entire camp was carefully inspected by the surgeon every morning and by the officer of the day each evening. The food was carefully inspected each day, and the cooks were instructed in the use of ovens and utensils and in the preparation and cooking of food. The commanding officer, Col. B. L. Spilman, gave every assistance possible in enforcing sanitary regulations, and frequently converted into orders all recommendations of medical officers. Our men became infected with malaria at Chickamauga Park, and at least 40 per cent of them exhibited undeniable symptoms. Malaria is almost unknown in West Virginia, especially in the north and east, among the mountains and foothills, so it is reasonable to think that it was not acquired before entering the army. The disease developed at Chickamauga Park and disappeared almost entirely at Knoxville and Columbus. One case that came from Morgantown, W. Va., I knew before entering the army and demonstrated that he had malaria by examination of the blood. I can furnish you micro-photographs if you desire them. The typhoid epidemic in our regiment undoubtedly proceeded from the contaminated well I spoke of, although I did not make a bacteriological examination of the water, having no facilities. No typhoid fever developed in the regiment until after the water from this well was used, and the majority of the cases developed within twenty days after its use was discontinued. In my opinion, the entire water supply of Chickamauga Park was contaminated in a way similar to that in which the well of which I have spoken was infected. While the superficial layers of earth and stone were in many places almost impervious to water, the deepest strata were full of fissures which admitted surface drainage and excreta from the sinks to the artesian wells from which the men drank. Flies

undoubtedly played an important part in the spread of the infection. During the stay of the regiment at Chickamauga Park I served on the staff of the division hospital, having charge of Ward A from July 10 until August 29. This ward contained 40 beds and was full all the time. Seventy per cent of the cases treated during the month of August were typhoid fever. These cases were transferred to Sternberg Hospital as rapidly as possible, so that in the time during which I was in service many cases were treated. After it could be done with safety, these cases were transferred to Sternberg Hospital as soon as the diagnosis was made; if this was not possible, they were moved as early in convalescence as possible. I had one case of Landry's disease which was fatal within twenty-four hours after the patient presented himself at sick call in his regiment (Fourteenth Minnesota).

In the First West Virginia we had at first an epidemic of diarrhea, with a few cases of dysentery. The diarrhea was attributed largely to indiscretions in diet and change from civil pursuits and habits to outdoor life and exercise, to which the majority of the men were unaccustomed. Malaria and typhoid fever were next encountered, and during the last four months of service venereal diseases were the most important and prevalent pathological condition present.

Major Baguley, who was detached from his regiment from June 4 until late in December, 1898, states that the only case of probable typhoid fever in our report, which began while he was medical officer, is case No. 2. He states that while this might have been a case of typhoid fever there were many cases of diarrhea, gastritis, and gastro-enteritis during the month of June at Chickamauga. He states:

At the division hospital, where the sick of this regiment were received, I do not recall any typhoid cases from this regiment until the latter part of July; and while the general infection which occurred later was attributed by the officers of the regiment to the "third well," drilled within the lines of the regiment, as but few cases developed until after the use of the water from this well, and while it might have been a contributing cause, I am still of the opinion that the epidemic was due to infection of the food of the men by flies.

I am on record, as surgeon in charge of the division hospital, as disapproving the diagnosis of "malarial remittent" in typhoid cases, and do not recall having seen half a dozen cases of malaria during my service in the Army, and my observations at the division hospital lead me to believe that almost without exception cases transferred to the hospital diagnosed malaria were typhoids. However, it must be remembered that these cases as a rule were not under the observation of the regimental surgeon more than twenty-four hours, many of them being transferred to the hospital the same day they reported at sick call.

FIRST PENNSYLVANIA VOLUNTEER INFANTRY.

Third Brigade, Second Division, First Army Corps.

This regiment was mustered into service at Mount Gretna, Pa., May 11, 1898. It reached Chickamauga Park, Ga., May 18.

The May report is signed by Lieut. William Harland, who makes no comments.

CONDENSED SICK REPORT, FROM MAY 11 TO MAY 31, INCLUSIVE.

Mean strength	792
Typhoid fever.....	1
Diarrhea.....	1
Gastro-enteritis.....	2
Other diseases.....	11
Total.....	15

^a It was specified by the board that toilet paper only should be used.

The case of typhoid fever was that of a private in Company B; the initial date of this case was May 12, the day following the date of mustering in. This man was furloughed two days later and apparently reported to his regiment at Chickamauga in August while still ill. He was sent to Sternberg Hospital and was discharged well October 16. However, it is altogether likely that a case of typhoid fever did accompany this regiment to Chickamauga. This was a private in Company I, who reported at sick call May 13, and remained off duty until June 6. The diagnosis in this case was diarrhea. This is not, however, the case of diarrhea which is recognized in the above-given tabular statement of the sickness for the month of May.

The June report is signed by Lieutenant Harland, who makes the following statement:

The health of the regiment is very good. The only illness prevalent is a mild malarial fever, with gastro-enteric symptoms, running a course of about two weeks.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	762
Febricula	2
Malaria	5
Typhoid fever	1
Chronic diarrhea	1
Other diseases	22
Total	31

The case of typhoid fever recognized in this report was that of a corporal in Company G, whose name first appears on sick report May 26, and who died from perforation of the bowels June 3.

The July report bears no comments.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,078
Typhoid fever	22
Other diseases	13
Total	35

In the August report, Lieutenant Harland makes the following statement:

There have been a number of cases of typhoid fever and malarial fever while in camp at Chickamauga Park. The most rigid sanitary precautions have been continually carried out, and the health of the regiment at the present time is very good.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	987
Typhoid fever	4
Malarial fever	20
Diarrhea	1
Other diseases	6
Total	31

This regiment left Chickamauga Park, Ga., August 29, and went into camp at Knoxville, Tenn. It remained at Knoxville until September 15, when it departed for Philadelphia. On September 17 the regiment was granted a furlough of thirty days. Many

men were taken sick after the regiment returned to Philadelphia. These, as well as those who were brought by hospital trains, were cared for in the different civil hospitals in Philadelphia and at the homes of the men.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,055
Dengue fever	28
Typhoid fever	19
Enteritis	4
Diarrhea	1
Malarial fever	12
Other diseases	2
Total	66

In the October report Surgeon Harland makes the following statement:

The men continue to get sick, and are cared for at their several homes or at the civil hospitals. Dengue fever and typhoid fever are the chief diseases. The regiment was mustered out of service October 26, 1898.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,055
Typhoid fever	109
Dengue fever	15
Malarial fever	7
Dysentery	2
Camp fever	1
Total	134

From these sick reports it would appear that typhoid fever developed in this regiment violently after it returned to Philadelphia. However, this is not the case. The great number of cases of typhoid fever reported in October result from a change in diagnosis of cases that had been carried over from the preceding months. Of the 109 cases of recognized typhoid fever registered in the October report, only 7 originated in October and only 27 developed after the regiment left Knoxville. All others were cases which had been carried over from preceding months, the most of which had been erroneously diagnosed.

The diagnosis of dengue observed in the records of this regiment deserves only a passing comment. That dengue should have prevailed in the First Pennsylvania Volunteer Infantry and should have been absent from all other regiments at Chickamauga Park or at Knoxville, is not even presumable. There can be only one conclusion concerning the report of this disease in this regiment, and that is that the diagnosis was erroneous.

The following is a list of the probable cases of typhoid fever in this regiment:

At Chickamauga, Ga.

No. 1. Company B: Typhoid fever, May 12; furloughed May 14; reported for duty in August, but was still sick with typhoid fever and was sent to Sternberg Hospital August 30. From this hospital the patient was discharged October 16.

No. 2. Company I: Diarrhea, May 13 to June 16.

- No. 3. Company D: Malaria, May 20 to July 15.
- No. 4. Company C: Febricula, May 26 to September 15. In hospital this case was diagnosed malaria and later typhoid fever.
- No. 5. Company G: Typhoid fever, May 26; died June 3.
- No. 6. Company D: Intermittent malaria, May 28; furloughed July 15; returned to duty October 16. In July, the time of furlough, the diagnosis of this case was changed to typhoid fever.
- No. 7. Company I: Malaria, May 30 to June 9.
- No. 8. Company G: Febricula, June 19; furloughed June 29; returned to duty October 16.
- No. 9. Company I: Typhoid fever, July 6; disposition not given.
- No. 10. Company K: Typhoid fever, July 6; disposition not given.
- No. 11. Company A: Typhoid fever, July 11; sent to division hospital July 31; there is no further record of this case.
- No. 12. Company E: Typhoid fever, July 21; sent to division hospital July 31; there is no further record of this case.
- No. 13. Company E: Typhoid fever, July 21; furloughed from Leiter Hospital August 12.
- No. 14. Company C: Typhoid fever, July 22; furloughed from division hospital July 24.
- No. 15. Company E: Typhoid fever, July 23 to October 16.
- No. 16. Company A: Typhoid fever, July 23; furloughed August 18.
- No. 17. Company E: Typhoid fever, July 25; sent to division hospital July 31; there is no further record of this case.
- No. 18. Company K: Typhoid fever, July 25; furloughed July 27.
- No. 19. Company C: Typhoid fever, July 25; furloughed September 15.
- No. 20. Company C: Typhoid fever, July 25; furloughed September 6.
- No. 21. Company E: Typhoid fever, July 29; died August 10.
- No. 22. Company F: Typhoid fever, July 29; sent to division hospital July 31; there is no further record of this case.
- No. 23. Company H: Typhoid fever, July 31; disposition not given.
- No. 24. Company E: Typhoid fever, July 31; disposition not given.
- No. 25. Company H: Typhoid fever, July 31; disposition not given.
- No. 26. Company not given: Typhoid fever, July 31 to October 16.
- No. 27. Company I: Dengue, August 1 to October 16.
- No. 28. Company F: Typhoid fever, August 1; sent to German Hospital September 17.
- No. 29. Company B: Typhoid fever, August 1; died August 27.
- No. 30. Company I: Enteritis, August 1 to September 15.
- No. 31. Company A: Typhoid fever, August 1 to September 15.
- No. 32. Company A: Dengue, August 1 to September 15.
- No. 33. Company H: Dengue, August 1 to September 15.
- No. 34. Company I: Typhoid fever, August 1 to September 15.
- No. 35. Company C: Typhoid fever, August 2 to September 16.
- No. 36. Company C: Typhoid fever, August 2 to October 16.
- No. 37. Company E: Typhoid fever, August 3 to October 16.
- No. 38. Company C: Dengue, August 3; furloughed September 11. After reaching home this case was diagnosed typhoid fever.
- No. 39. Company not given: Dengue, August 3 to September 15.
- No. 40. Company I: Typhoid fever, August 3 to October 16.
- No. 41. Company K: Malaria, August 3 to September 15.
- No. 42. Company D: Typhoid fever, August 4; died August 10.
- No. 43. Company B: Typhoid fever, August 5; furloughed August 19.
- No. 44. Company A: Typhoid fever, August 5; furloughed September 1.
- No. 45. Company E: Typhoid fever, August 8 to October 16.
- No. 46. Company B: Dengue, August 8 to October 16. At home this case was diagnosed typhoid fever.
- No. 47. Company B: Dengue, August 8; furloughed September 11.
- No. 48. Company K: Typhoid fever, August 9; furloughed August 19.
- No. 49. Company C: Dengue, August 9; furloughed August 19.
- No. 50. Company I: Malaria, August 10; furloughed September 15.
- No. 51. Company I: Typhoid fever, August 10 to October 16.
- No. 52. Company K: Malaria, August 10; furloughed August 25.
- No. 53. Company B: Dengue, August 11; furloughed September 15.
- No. 54. Company E: Typhoid fever, August 12 to October 16.
- No. 55. Company B: Typhoid fever, August 12; died August 27.
- No. 56. Company H: Malaria, August 12; furloughed September 15.
- No. 57. Company D: Typhoid fever, August 12; furloughed August 20.
- No. 58. Company G: Typhoid fever, August 12 to October 16.
- No. 59. Company D: Typhoid fever, August 13; furloughed September 6.
- No. 60. Company E: Dengue, August 13 to October 16.
- No. 61. Company C: Dengue, August 13 to September 16.
- No. 62. Company I: Enteritis, August 13; furloughed September 15.
- No. 63. Company B: Dengue, August 13; furloughed September 15.
- No. 64. Company E: Typhoid fever, August 13; furloughed August 19.
- No. 65. Company K: Typhoid fever, August 13 to October 16.
- No. 66. Company K: Malaria, August 15 to September 15. There are several cases which on the records are registered as having reported for duty September 15. In all probability this means that the patients from this regiment in the division hospital who felt able to go home with the regiment obtained permission to leave the hospital on September 15, preparatory to going home with the regiment. It does not mean that these men had recovered.
- No. 67. Company D: Typhoid fever, August 16 to October 16. A point here needs some explanation. It will be seen that there are many cases that reported for duty October 16. This means that the sick from this regiment in Philadelphia who were able to do so reported when the regiment was mustered out. One must not infer from the fact that these men were returned to duty October 16 that they had fully recovered at this time.
- No. 68. Company C: Typhoid fever, August 16 to September 15.
- No. 69. Company B: Typhoid fever, August 16 to September 15.
- No. 70. Company B: Typhoid fever, August 16 to October 16.
- No. 71. Company D: Enteritis, August 16 to September 15.
- No. 72. Company G: Typhoid fever, August 16 to October 16.
- No. 73. Company I: Typhoid fever, August 17 to October 16.
- No. 74. Company A: Typhoid fever, August 17; died October 8.
- No. 75. Company D: Typhoid fever, August 17 to October 16.
- No. 76. Company E: Typhoid fever, August 17 to October 16.
- No. 77. Company I: Typhoid fever, August 17 to September 17.
- No. 78. Company A: Typhoid fever, August 17; died October 4.
- No. 79. Company K: Typhoid fever, August 18 to October 16.
- No. 80. Company C: Malaria, August 18 to October 16.
- No. 81. Company H: Typhoid fever, August 18 to October 16.
- No. 82. Company C: Malaria, August 18 to October 16.
- No. 83. Company E: Typhoid fever, August 18 to October 16.
- No. 84. Company F: Typhoid fever, August 18 to October 16.
- No. 85. Company A: Dengue, August 18 to September 15.
- No. 86. Company K: Typhoid fever, August 18 to October 16.
- No. 87. Company A: Typhoid fever, August 18 to October 16.
- No. 88. Company C: Typhoid fever, August 18; disposition not given.
- No. 89. Company G: Typhoid fever, August 19 to October 16.
- No. 90. Company B: Typhoid fever, August 19 to October 16.
- No. 91. Company B: Typhoid fever, August 19 to October 16.
- No. 92. Company F: Malaria, August 20; furloughed August 31.
- No. 93. Company G: Typhoid fever, August 20 to October 16.
- No. 94. Company H: Typhoid fever, August 20; died September 13.

- No. 95. Company C: Typhoid fever, August 20 to September 15.
 No. 96. Company II: Typhoid fever, August 20 to October 16.
 No. 97. Company F: Typhoid fever, August 20 to October 16.
 No. 98. Company G: Typhoid fever, August 21 to October 8.
 No. 99. Band: Typhoid fever, August 21 to September 15.
 No. 100. Company F: Typhoid fever, August 21; died September 23.
 No. 101. Company D: Typhoid fever, August 21 to October 16.
 No. 102. Company D: Typhoid fever, August 21 to September 15.
 No. 103. Company C: Malaria, August 21; still sick September 30.
 No. 104. Company C: Typhoid fever, August 21 to October 16.
 No. 105. Company K: Typhoid fever, August 22 to October 16.
 No. 106. Company D: Malaria, August 23 to October 16.
 No. 107. Company K: Typhoid fever, August 23 to October 16.
 No. 108. Company K: Typhoid fever, August 23 to September 16.
 No. 109. Company D: Typhoid fever, August 24 to October 16.
 No. 110. Company A: Dengue, August 24 to September 15.
 No. 111. Company not given: Dengue, August 24 to September 15.
 No. 112. Company D: Typhoid fever, August 24 to October 16.
 No. 113. Company E: Typhoid fever, August 25 to October 16.
 No. 114. Company G: Typhoid fever, August 25; sent to University Hospital, in Philadelphia, August 27.
 No. 115. Company D: Typhoid fever, August 25 to October 16.
 No. 116. Company B: Typhoid fever, August 26 to October 16.
 No. 117. Company K: Typhoid fever, August 27 to October 16.
 No. 118. Company B: Typhoid fever, August 27; sent to Episcopal Hospital without date.
 No. 119. Company I: Typhoid fever, August 27 to October 16.
 No. 120. Company I: Dengue, August 27 to October 16.
 No. 121. Company C: Malaria, August 28; sent to Sternberg Hospital August 30; discharged October 16. In hospital this case was diagnosed typhoid fever.
 No. 122. Company A: Malaria, August 28; sent to Sternberg Hospital August 30; furloughed October 21. In hospital this case was diagnosed continued malaria.
 No. 123. Company I: Typhoid fever, August 28; sent to Sternberg Hospital August 30. Here the disease was diagnosed continued malaria, and the patient was furloughed September 12.
 No. 124. Company B: Malaria, August 28; sent to Sternberg Hospital August 30. Here the disease was diagnosed continued malaria, and the patient was discharged October 16.
 No. 125. Company B: Malaria, August 28; sent to Sternberg Hospital August 30. Here the disease was diagnosed continued malaria, and the patient was discharged October 16.
 No. 126. Company F: Malaria, August 28; sent to Sternberg Hospital August 30. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 15.
 No. 127. Company F: Typhoid fever, August 28 to October 16.
 No. 128. Company B: Malaria, August 28; sent to Sternberg Hospital August 30. Here the disease was diagnosed typhoid fever, and the patient was discharged October 16.

At Knoxville, Tenn.

- No. 129. Company B: Malaria, August 30; died in Sternberg Hospital September 8. In hospital this case was diagnosed typhoid fever.
 No. 130. Company G: Typhoid fever, August 30 to October 16.
 No. 131. Company K: Typhoid fever, August 30; still sick in German Hospital October 31.
 No. 132. Company G: Typhoid fever, August 30; sent to division hospital without date.
 No. 133. Company G: Malaria, August 30; sent to division hospital August 30. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 5.
 No. 134. Company D: Malaria, August 30; sent to division hospital August 30. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 10.

No. 135. Company I: Malaria, August 31; sent to division hospital without date. There is no further record of this case, and there is no evidence that this man was ever returned to duty.

- No. 136. Company B: Malaria, August 31 to October 16.
 No. 137. Company D: Malaria, August 31; sent to division hospital without date. There is no further record of this case.
 No. 138. Company B: Typhoid fever, August 31 to October 16.
 No. 139. Company B: Remittent malaria, September 1; still sick September 30.
 No. 140. Company K: Typhoid fever, September 1 to October 16.
 No. 141. Company K: Typhoid fever, September 1 to October 16.
 No. 142. Company I: Typhoid fever, September 1 to October 16.
 No. 143. Company C: Typhoid fever, September 1; still sick in hospital October 31.
 No. 144. Company E: Dysentery, September 1 to November 16. In hospital this case was diagnosed typhoid fever.
 No. 145. Company E: Dengue, September 1 to October 16. In hospital this case was diagnosed typhoid fever.
 No. 146. Company I: Typhoid fever, September 1 to October 17.
 No. 147. Company B: Dengue, September 1; furloughed September 11.
 No. 148. Company K: Malaria, September 1; furloughed September 11.
 No. 149. Company II: Malaria, September 1; furloughed September 15.
 No. 150. Company G: Typhoid fever, September 1 to November 16.
 No. 151. Company D: Malaria, September 1 to October 16. In hospital this case was diagnosed typhoid fever.
 No. 152. Company B: Typhoid fever, September 1 to 15.
 No. 153. Company C: Typhoid fever, September 1; died September 18.
 No. 154. Company K: Dengue, September 1; furloughed September 13.
 No. 155. Company G: Malaria, September 1; furloughed September 15.
 No. 156. Company II: Typhoid fever, September 1; still sick in hospital October 31.
 No. 157. Company K: Typhoid fever, September 1; furloughed September 17.
 No. 158. Company D: Typhoid fever, September 1 to October 16.
 No. 159. Company K: Dengue, September 1; furloughed September 13.
 No. 160. Company H: Typhoid fever, September 1; still sick in Pennsylvania hospital October 31.
 No. 161. Company A: Typhoid fever, September 1, furloughed September 12.
 No. 162. Company B: Typhoid fever, September 1; furloughed September 12.
 No. 163. Company H: Typhoid fever, September 1; furloughed September 9.
 No. 164. Company C: Dengue, September 3; sent to German Hospital September 17.
 No. 165. Company K: Typhoid fever, September 3; returned to duty September 13. Cases of this kind have already been commented upon. As has been stated, men who could possibly leave the hospitals at the time when the regiment departed for Philadelphia asked permission and were allowed to do so. Many of these cases are recorded as "returned to duty." It must not be inferred from this that these men had recovered. On September 12 a hospital train conveyed to Philadelphia all the sick who could bear transportation.
 No. 166. Company D: Typhoid fever, September 3 to October 16.
 No. 167. Company G: Typhoid fever, September 3 to October 16.
 No. 168. Company B: Typhoid fever, September 5; sent to Episcopal Hospital September 17.
 No. 169. Company C: Typhoid fever, September 6; sent to German Hospital without date.

No. 170. Company G: Typhoid fever, September 6; furloughed September 14.

No. 171. Company B: Typhoid fever, September 6 to October 16.

No. 172. Company C: Typhoid fever, September 6; furloughed October 1.

No. 173. Company G: Malaria, September 6; furloughed September 12. At home this case was diagnosed typhoid fever.

No. 174. Company B: Typhoid fever, September 6 to October 16.

No. 175. Company C: Typhoid fever, September 6 to October 18.

No. 176. Company —: Typhoid fever, September 6; furloughed September 12.

No. 177. Company B: Typhoid fever, September 6; furloughed September 12.

No. 178. Company F: Typhoid fever, September 7; furloughed November 12.

No. 179. Company G: Typhoid fever, September 7; furloughed September 12.

No. 180. Company D: Typhoid fever, September 8; sent to University Hospital September 12.

No. 181. Company E: Typhoid fever, September 8; sent to Medico-Chirurgical Hospital September 19.

No. 182. Company C: Typhoid fever, September 8; sent to Methodist Hospital September 12.

No. 183. Company G: Dengue, September 8 to October 16.

No. 184. Company H: Typhoid fever, September 9 to October 16.

No. 185. Company G: Typhoid fever, September 9; sent to Timothy Hospital September 12.

No. 186. Company I: Typhoid fever, September 11; sent to Presbyterian Hospital without date.

No. 187. Company C: Dysentery, September 11 to October 16.

No. 188. Company A: Typhoid fever, September 11; sent to University Hospital September 12.

No. 189. Company B: Malaria, September 12; sent to Methodist Hospital without date.

No. 190. Company C: Dengue, September 12 to October 16.

No. 191. Company C: Typhoid fever, September 14; sent to Presbyterian Hospital without date.

No. 192. Company I: Typhoid fever, September 14; sent to Methodist Hospital September 17.

No. 193. Company B: Camp fever, September 14; sent to hospital September 17.

No. 194. Company C: Typhoid fever, September 14; sent to Presbyterian Hospital September 17.

After leaving Knoxville, Tenn.

No. 195. Company D: Typhoid fever, September 15; sent to German Hospital September 17.

No. 196. Company I: Typhoid fever, September 16; sent to German Hospital without date.

No. 197. Company H: Typhoid fever, September 16; sent to hospital without date.

No. 198. Company B: Typhoid fever, September 16; sent to Presbyterian Hospital September 17.

No. 199. Company G: Typhoid fever, September 16; sent to hospital September 17.

No. 200. Band: Typhoid fever, September 17; sent to St. Joseph's Hospital without date.

No. 201. Company K: Typhoid fever, September 18; sent to hospital September 19.

No. 202. Company K: Typhoid fever, September 19; sent to Presbyterian hospital without date.

No. 203. Company A: Typhoid fever, September 19; sent to Presbyterian Hospital without date.

No. 204. Company G: Typhoid fever, September 20; sent to Presbyterian Hospital without date.

No. 205. Company I: Typhoid fever, September 21; sent to hospital without date.

No. 206. Company B: Typhoid fever, September 22; sent to Presbyterian Hospital September 27.

No. 207. Band: Typhoid fever, September 24; sent to Presbyterian Hospital without date.

No. 208. Company B: Typhoid fever, September 24; sent to Presbyterian Hospital without date.

No. 209. Band: Typhoid fever, September 24; sent to German Hospital without date.

No. 210. Company G: Typhoid fever, September 26; sent to German Hospital without date.

No. 211. Company B: Typhoid fever, September 27; sent to Samaritan Hospital September 27.

No. 212. Company F: Typhoid fever, September 30; sent to German Hospital without date.

No. 213. Company D: Typhoid fever, September 30; sent to hospital without date.

No. 214. Company K: Dengue, September 30; still sick October 31.

No. 215. Company A: Typhoid fever, October 4; sent to Presbyterian Hospital without date.

No. 216. Company D: Typhoid fever, October 4; sent home October 18.

No. 217. Company G: Typhoid fever, October 4; sent to Presbyterian Hospital October 4.

No. 218. Company E: Typhoid fever, October 4; sent to German Hospital October 4.

No. 219. Company K: Malaria, October 5; sent to German Hospital without date, and was reported still sick October 31.

No. 220. Company D: Typhoid fever, October 10; sent home without date.

No. 221. Company H: Convalescing from typhoid fever, October 16. The initial date of this illness is not given.

No. 222. Company A: Typhoid fever, without date; sent to Methodist Hospital without date.

SUMMARY.

Assembled at Mount Gretna, Pa., April 28, 1898.

Mustered into United States service May 11, 1898.

Arrived at Chickamauga Park, May 18, 1898.

Strength on arrival, 792.

Date of first case of probable typhoid fever, May 12, 1898.

Date of first case of recognized typhoid fever, May 12, 1898.

Left Chickamauga, August 29, 1898.

Strength on departure, 1,071.

Number of cases of probable typhoid fever developed at Chickamauga..... 129

Arrived at Knoxville, Tenn., August 30, 1898.

Left Knoxville, September 15, 1898.

Number of cases of probable typhoid fever developed at Knoxville..... 66

Arrived at Philadelphia, Pa., September 16, 1898.

Number of cases of probable typhoid fever developed after leaving Knoxville..... 27

Total number of cases of probable typhoid fever developed in the First Pennsylvania Volunteer Infantry from May to October, 1898..... 222

These 222 cases were diagnosed as follows:

Typhoid fever	169
Malaria.....	24
Dengue.....	22
Diarrhea.....	1
Febricula.....	1
Enteritis.....	3
Dysentery.....	1
Camp fever	1

Total..... 222

It is probable that this regiment reached Chickamauga quite widely infected with typhoid fever, and that the number of cases in our list is short of the

actual one. Attention may be recalled to the statement of Lieutenant Harland in the June report. In this he states:

The only illness prevalent is a mild malarial fever, with gastro-enteric symptoms, running a course of about two weeks.

Considering this statement in the light of the evidence that we have since gained concerning the rarity of malaria at Chickamauga and in the light of the subsequent history of this regiment, we think that we must conclude that the surgeon was describing the earlier cases of the typhoid epidemic which led to the early return of this command to Philadelphia.

When this command reached Chickamauga it at first obtained its supply of drinking water from a driven well located on the Brotherton road, and between the camp of this regiment and that of the Second Ohio. Major Harland stated to us that the water from this well became inadequate in quantity and doubtful in quality. A sample of it was sent to Philadelphia for analysis. It appears that the examination was altogether chemical, and that an excess of chlorine was reported. "The excess of chlorine being out of proportion to the nitrogen, was supposed to be of mineral origin." (We have not been able to secure a copy of this analysis.) After the failure of this well water was for a short while obtained, according to Major Harland, from the pipes carrying Chickamauga Creek water. How long water was obtained from this source we have been unable to ascertain. Major Harland told us that the pipe water was found to be muddy as soon as heavy rains fell, and after this occurred water was hauled in barrels from Georgia Mineral Spring. Later the supply was obtained from the Boynton Spring, because it was nearer camp. There were no pipes in either of these springs, and the water was dipped up in pails, placed in headless barrels, and hauled to the regiment.

On account of the rocky character of the soil sinks could not be dug to a depth of more than 2 feet. This shallow drainage soon became filled and very offensive. Major Harland spoke of them as being in "a loathsome condition." This condition continued until the camp was moved into the open. After heavy rains these shallow sinks overflowed, polluted the soil for some distance around them, and became "exceedingly offensive." Add to these conditions the fact that the flies swarmed alternately on fecal matter and food, and it must be admitted that the conditions favorable to the spread of typhoid fever were not wanting in this camp.

In regard to the malarias that prevailed according to the sick report soon after this regiment reached Chickamauga, Major Harland made the following statement to us:

We had a form of malaria that looked much like typhoid fever, but the men would recover in a week or ten days, so I supposed it was not that. I did not recognize it as malaria; there were no pronounced chills; there was intense headache, intense pain in the kidneys, and evidently engorgement of the kidney. I do not

know what the disease was. Sometimes I called it "camp fever" and sometimes I called it "quotidian malaria." We did not have any blood examinations made.

In answer to questions Major Harland stated that the men suffering from these so-called malarias were sent to the Second Division hospital, and that about the middle of August many of these cases developed into typhoid fever. By reference to our list of cases it will be seen that typhoid fever became epidemic earlier than Major Harland—who was then speaking from memory and general impressions—thought. Our list shows only occasional cases for the first two months. However, we are of the opinion that we have not gotten all the earlier cases. For instance, we show only one case for June, and it is in his report for this month that Major Harland makes the statement already quoted in which he refers to the epidemic of malaria with gastro-enteric symptoms and running for two weeks. However, following the list as we have it, the epidemic began to show itself in pronounced form during the latter part of July and continued until the regiment was furloughed in Philadelphia. We believe, however, that if we could have obtained all the facts it would have been found that typhoid fever progressed more evenly in this command than is indicated by the charts.

It is unfortunate that we have not been able to ascertain the exact time when this regiment used the Chickamauga Creek water, because it would be of great interest to endeavor to determine whether or not this water influenced the typhoid curve. Moreover, this appears to be the only regiment in this division that used this water.

In his testimony before our board Major Harland stated that the tents of this command while at Chickamauga became very filthy, that they were not opened and their contents exposed to the sun daily, and that he frequently observed mold and fungi growing in the tents. He strongly urged a change of location, and finally the tents were shifted from the wood into the adjoining open space. He did not think that the cases of typhoid fever were grouped by tents, or at least he had not observed that men in the same tent were likely to develop typhoid fever about the same time, but he had noticed that one company had suffered much less than others in its total sickness. The men of this fortunate company were not ranked as high socially at home as were the men of companies that had more illness. We frequently heard similar statements from the medical officers of other regiments. It seemed to be quite widely observed that men from the high classes of society suffered more from illness than others less fortunately situated socially. We state that this seemed to be widely observed, but on this point we have no positive information. As a general rule we found that general impressions were erroneous. However, it is possible that the men who had more money to spend indulged themselves more freely in purchases from hucksters and other venders of delicacies of doubtful

composition and antecedents. There is no proof, however, that such men furnished a larger proportion of cases of typhoid fever.

In his testimony before our board, Major Harland made the following statement of his opinion concerning the origin and spread of typhoid fever in his regiment:

The regiment was entirely free from typhoid fever until the disease was brought in some other regiments that came to the park. The men may have gotten the infection in milk or their clothes, and I think that it was spread by flies bringing the matter from the sinks.

We quote this statement mainly because it was so commonly made to us. Each medical officer seemed confident that his own regiment was free from typhoid fever until some other command brought the disease to the park. Now, if we turn back to the sick reports of the First Pennsylvania, we find that typhoid fever was reported in this command every month. Why look for its importation from other organizations when the regiment itself took the infection with it from Mount Gretna, and its surgeon officially recognized its presence in every monthly report?

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Chatham, John P.....	Pvt., B	1898, Sept. 8	Chickamauga, Ga	Typhoid.
Dolan, Charles.....	Pvt., E	Aug. 5	.....do	Appendicitis.
Elliott, George.....	Pvt., B	Aug. 27	.....do	Typhoid.
Foley, John A.....	Pvt., F	Sept. 23	Philadelphia, Pa	Do.
Kohl, Charles B.....	Pvt., A	Oct. 8	.....do	Do.
Kohring, William J.....	Pvt., E	Aug. 8	Chickamauga, Ga	Camp fever; typhoid.
McIntyre, John D....	Pvt., H	Sept. 13	Philadelphia, Pa	Typhoid.
Maguire, James F....	Pvt., C	Sept. 18	.....do	Do.
Martin, Mark.....	Pvt., G	Oct. 30	.....do	Do.
Marren Frank.....	Pvt., B	Aug. 28	.....do	Do.
Pearsons, Henry.....	Lt., H	Dec. 1	.....do	Tuberculosis.
Schaperkottor, Bernard.	Pvt., D	Aug. 10	Chickamauga, Ga	Typhoid.
Williams, Howard A..	Pvt., A	Oct. 4	Philadelphia, Pa	Do.
Zane, Jacob S.....	Corpl., G	July 2	.....do	Do.

Total deaths.....	14
Deaths due to typhoid fever.....	12
Percentage of deaths among cases of probable typhoid fever (222), 5.40.	
Percentage of deaths among cases of recognized typhoid fever (169), 7.10.	

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST PENNSYLVANIA VOLUNTEER INFANTRY.

Medical officers.

William G. Harland, major and surgeon, Philadelphia, Pa.

Joseph P. Tunis, lieutenant and assistant surgeon, Philadelphia, Pa.

Major Harland states:

I was not in charge of the records nor was I responsible for the medical department of the regiment until June 30, when I was assigned to duty as regimental surgeon. Before that date I acted as assistant surgeon, Maj. L. S. Smith being regimental surgeon. After I took charge all sick were sent to Second Division hospital in the first days of their illness, consequently all my records are necessarily faulty and inaccurate. I had no means of following up the cases, being too busy.

I am sure that there were fevers besides typhoid at Camp Thomas. I studied the cases as best I could and have come to the conclusion that most of the symptoms in these cases were those of dengue. I send you the following quotation from a paper which will probably appear in the supplement to the report of the adjutant-general of the National Guard of Pennsylvania for 1898:

"It was an infectious disease with an incubation period of a day or so. It began suddenly with chills and intense occipital headache, pain in back and in bones. The temperature was high (105° to 106°) and was accompanied with mild delirium, insomnia, restlessness, and nightmares. Occasionally petechiae and blotching of the skin were observed. These symptoms continued for from three to four days; then there was a rapid decline of the fever. After a few days symptoms of catarrhal jaundice, yellow skin, and clay stools set in. Constipation alternated with diarrhea. The acute symptoms passed away in a week, but the patients were left much prostrated and unnerved. The disease was quick to recur, but was not fatal. The rapid decline of the fever, the absence of the usual intestinal symptoms, of the usual characteristic stools, spots, and facies, all precluded the idea of typhoid in typical form."

I myself had two attacks after leaving, one in December and another in April, both just after handling camp equipments. My sister had an attack shortly after my return from Knoxville. I have had typhoid fever and have treated many cases in Philadelphia, and I feel convinced that some fever besides typhoid fever was present in camp during June and July. I therefore feel justified in objecting to the conclusions you draw from the statements made in my reports. There were many cases of diarrhea which were ascribed at the time to the change of water and to travel rations; some of these may have been mild cases of typhoid fever. Your deduction, that we had the typhoid infection when we left Philadelphia and that this was a source of the epidemic, is probably true, but the cases I referred to in the June report were not typhoid fever. To ignore the other fevers is to ignore, in my opinion, an important factor in the predisposition to disease. It also tends to lessen the mortality percentage and can not but vitiate your conclusions.

Comment: As we have already stated in giving the history of this regiment, we do not believe that the claim that dengue prevailed extensively in the First Pennsylvania Volunteer Infantry, while it was absent from all other regiments of the First and Third Army Corps, deserves any serious attention. It must be erroneous.

FOURTEENTH MINNESOTA VOLUNTEER INFANTRY.

Third Brigade, Second Division, First Army Corps.

The May report is signed by Major Cole, who makes the following statement:

We are having quite an epidemic of measles, which we brought with us from Camp Ramsey. The diarrheas are simply catarrhal, probably caused by change of climate. It is difficult to get the amount of water we need, and at first the men drank surface water. We can not get sufficient water for common cleanliness.

CONDENSED SICK REPORT FROM MAY 10 TO MAY 31, INCLUSIVE.

Mean strength	1,032
Diarrhea	15
Indigestion	6
Dysentery	2
Malaria	1
Total	24

In the June report Major Cole makes the following statement:

We have had quite an explosion of measles, which we brought with us from Camp Ramsey. There are at present no recent cases. Gonorrheal cases were frequent after pay day. Enterocolitis was brought on mostly from buying truck from hucksters and eating it. There has been no epidemic disease in camp.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,059
Diarrhea	4
Indigestion	4
Gastro-enteritis	18
Typhoid fever	3
Malaria	1
Other diseases	63
Total	93

It would be rather interesting to know the views of the surgeon of this regiment concerning an epidemic disease, as, is seen above, he states that there has been no epidemic disease in the camp, and still he reports quite an explosion of measles and records three cases of typhoid fever.

In the July report Major Cole states:

A good many cases of malaria have occurred, and are probably due to excessive rain, followed by extreme heat. We now have elegant water and the diarrheas are decreasing.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,317
Typhoid fever	5
Enteritis	1
Entero-colitis	4
Gastro-enteritis	6
Gastritis	1
Indigestion	1
Malaria	26
Other diseases	55
Total	99

The August report bears no comments.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,142
Malaria	120
Typhoid fever	27
Gastro-enteritis	7
Entero-colitis	4
Acute indigestion	3
Diarrhea	11
Gastritis	1
Dysentery	1
Other diseases	30
Total	204

This regiment left Chickamauga Park, Ga., August 28, and proceeded to Camp Poland, near Knoxville, Tenn.

In the September report Major Cole makes the following statement:

This command left Camp Poland, where it was in the Third Brigade of the Third Division of the First Army Corps, September 20, and proceeded to St. Paul, Minn., to be mustered out of service. It arrived at St. Paul September 23 and located camp at Kittsondale. The regiment was furloughed for thirty days, September 29.

We have failed to obtain an abstract of this report.

We will not give a list of the probable typhoid fever cases in this regiment, but will content ourselves with a statement of the general conclusions reached after a thorough investigation of the regimental and hospital sick reports.

In the first place, we will state that we have been unable to ascertain the date when this regiment reached Chickamauga Park. The regimental reports do not give this date, and we have been unable to obtain it from the Adjutant-General's Office. We can only state that it was sometime during the latter half of May, probably about May 18, as this is the date upon which the other regiments of this brigade reached Chickamauga.^a The first question that arises is whether or not this regiment brought the typhoid infection with it when it reached Chickamauga. The first suspicious case is that of a private in Company K (No. 1), who reported sick May 27 and was returned to duty June 15. The diagnosis in this case was malaria. During the month of June there were three suspicious cases. Two of these occurred on June 3, and are as follows:

No. 2. Company M: Typhoid fever, June 3; returned to duty from division hospital July 6.

No. 3. Company E: Typhoid fever, June 3; furloughed August 3.

The other June case had its initial date on June 22, and is as follows:

No. 4. Company M: Typhoid fever, June 22; returned to duty July 10.

From these data it is certainly fair to conclude that this regiment, like most others at Chickamauga, reached that place infected with typhoid fever; however, the typhoid infection did not spread at first rapidly. During the month of July there were 15 probable cases; in August there were 95 cases; in September the number ran up to 139; besides these there are 33 cases the initial dates of which can not be ascertained; making in all 286 probable cases. Of the 286 probable cases, 146 have a diagnosis of typhoid fever in either the regimental or the hospital records; the remainder, 140 in number, are diagnosed malaria.

SUMMARY.

Assembled at Camp Ramsey, St. Paul, Minn., in April, 1898.	
Mustered into United States service May 10, 1898.	
Arrived at Chickamauga Park May 18, 1898	
Strength on arrival, 1,032.	
Date of first case of probable typhoid fever, May 27, 1898.	
Date of first case of recognized typhoid fever, June 3, 1898.	
Left Chickamauga Park August 29, 1898.	
Strength on departure, 1,277.	
Number of cases of probable typhoid fever developed at Chickamauga	114
Arrived at Knoxville, Tenn., August 30, 1898.	
Left Knoxville September 20, 1898.	
Number of cases of probable typhoid fever developed after leaving Chickamauga	139
Number of cases of probable typhoid fever for which the initial date can not be found in the records	33
Total number of cases of probable typhoid fever in the Fourteenth Minnesota from May to September, 1898..	286
These 286 cases were diagnosed as follows:	
Typhoid fever	146
Malaria	140
Total	286

^a We have ascertained from Major Cole that May 18 is the correct date.

From information furnished us by Major Cole, surgeon of this regiment, we have condensed the following: At Camp Ramsey many of the men suffered from colds and one case of measles developed. At Chickamauga the tents were not moved from their original positions. Most of the men slept on the ground all the time at Chickamauga, because lumber could not be obtained. At Chickamauga the drinking water was at first obtained from the well on the Brotherton road already referred to in discussing the history of the First Pennsylvania. This well was situated in a ravine at the intersection of the three regiments of this brigade. The water from this well was at first clear, but after it had been drawn upon for eight or ten weeks it became turbid and gave off a fecal odor. At first there were many cases of malaria, with typhoid conditions. These cases began to develop about July 4, 1898. The piped water was used for animals, but the men were instructed not to drink it. However, they may have filled their canteens with this water while watering their horses. After the well water became offensive the drinking water supply was brought a distance of about 6 miles from a spring, the name of which Major Cole could not give us.

The company sinks could not be dug deep enough, and after heavy rains they overflowed and became highly offensive. Attempts to fill them with ashes caused them to overflow and made matters worse. The dirt thrown from the sinks in digging them became, under the effects of the sun, hard clods, and when thrown back into the pits did not absorb the fluid. It was absolutely impossible to keep the sinks in good condition.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Barnard, John D.....	Sgt., H.	1898. Oct. 18	Olivia, Minn.....	Typhoid.
Chellsen, Frank E.....	Pvt., b'nd	Nov. 19	St. Joseph's Hospital, St. Paul, Minn.	Typhoid and pneumonia.
Collyer, Percy.....	Mus., H.	May 28	Camp Thomas, Ga.....	Pneumonia.
Clusman, William.....	Pvt., L.	Oct. 31	.....	Typhoid.
Gibson, Joshua E.....	Pvt., B.	Nov. 10	.....	Typhoid and pneumonia.
Hogan, Arthur S.....	Corpl., K.	Sept. 22	Division hospital, Knoxville, Tenn.	Typhoid.
Houck, Geo. Miles.....	Sgt., D.	Oct. 1	Chicago, Ill.....	Do.
Hutchinson, John S.....	Pvt., H.	July 19	.....	Do.
McEwen, John G.....	Pvt., C.	Oct. 5	Chickamauga, Ga.....	Do.
Peterson, Alfred R.....	Pvt., F.	Aug. 8	Camp Thomas, Ga.....	Typhoid fever.
Rose, Harry S.....	Pvt., I.	Sept. 6	Camp Poland, Tenn..	Typhoid.

Two deaths from typhoid, as shown by hospital records, should be added to this list.

Total deaths..... 13
Deaths due to typhoid fever..... 12

Percentage of deaths among probable cases of typhoid fever (286), 4.19.

Percentage of deaths among cases of recognized typhoid fever (146), 8.21.

COMMUNICATIONS FROM THE SURGEONS OF THE FOURTEENTH MINNESOTA VOLUNTEER INFANTRY.

Medical officers.

Alvinza B. Cole, major and surgeon, Fergus, Minn.

Charles E. Dutton, captain and assistant surgeon, Minneapolis, Minn.

John H. Dorsey, lieutenant and assistant surgeon, Glencoe, Minn.

Under date of July 18, 1899, Major Cole sends us the following statement:

When we arrived at Chickamauga there was not water enough in the well on the Brotherton road to supply the three regiments of our brigade. On account of the scarcity our men dug wells in the shale rock in the ravine near our camp and drank surface water. After a time the water from the well acquired a fecal odor. On closing the well, we hauled water from a spring 6 miles distant.

As to whether we carried typhoid fever with us from Camp Ramsey or not, I am of the opinion that we did not. The case of the private that sickened May 27, and was returned to duty June 15, does not look to be typhoid fever. One could scarcely expect a case of that disease to recover sufficiently to return to duty in eighteen days. We left Camp Ramsey May 15, and our first case of typhoid fever was reported June 3, thereby giving time for it to develop under the favorable condition that obtained with us at that time. It is true that the length of time does not exclude the possibility that the disease might have been brought with us, but the inference would naturally be drawn that, in the absence of any history to that effect, it was acquired after our arrival at Camp Thomas.

SECOND OHIO VOLUNTEER INFANTRY.

Third Brigade, Second Division, First Army Corps.

This regiment reached Chickamauga Park, Ga., May 18, 1898. The first sick report covers the period from May 10 to May 31.

In the May report Dr. C. S. Mueller, acting surgeon, makes the following statement:

A slight increase of diarrhea is prevalent in camp, possibly due to excessive drinking of water. The water supply of the camp is good in quality, but very deficient in quantity. The entire command was vaccinated during May. The sanitary condition of the camp is satisfactory.

CONDENSED SICK REPORT FROM MAY 10 TO 31, INCLUSIVE.

Mean strength	815
Indigestion	17
Dysentery	16
Colic	17
Diarrhea	2
Enteritis	3
Gastritis	2
Other diseases.....	36
Total	93

In the June report Captain Mueller states:

The general health of the command was good. Quite a number of cases of fever of no special type occurred, but mostly disappeared on calomel treatment. They seemed to be cases of enteritis caused

possibly by ptomaines. Four hundred and six new recruits came in and were mostly vaccinated by the regimental surgeon. The water supply was very scarce and the quality quite bad after the hard rains, so that a condemnation of the well supplying the water was considered. An inspection was made every afternoon by the regimental surgeon and the officer of the day. The garbage holes and sinks were covered twice a day, if possible, with ashes or with dust.

The companies received Buzzicott's cooking outfits.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,224
Gastro-enteritis	3
Diarrhea	8
Measles	3
Gonorrhea	25
Enteritis	2
Malarial typhoid	1
Other diseases	23
Total	65

The case of so-called malarial typhoid was that of a private in Company L. He was taken sick on June 22, and was sent to division hospital, where he died July 3.

Sick report for July is signed by Capt. Louis J. Stueber who makes no comment.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,329
Gonorrhea	28
Malarial typhoid	10
Malarial tertian	7
Malaria	1
Diarrhea	3
Intermittent fever	1
Other diseases	32
Total	82

The sick report for the month of August is signed by Captain Stueber without comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,329
Malarial typhoid	17
Typhoid fever	22
Malaria	4
Tertian malaria	18
Malarial fever	83
Diarrhea	7
Dysentery	1
Gastritis	1
Not diagnosed	2
Total	155

This report gives the following additional figures:

Returned to duty	35
Died	2
Remaining sick in quarters and in hospital	142
Total	179

Notwithstanding the above statement, the sick report for August shows a list of 196 names and cases. This regiment left Chickamauga Park, Ga., and proceeded to Knoxville, Tenn., August 28. During its stay at Chickamauga Park 6 deaths occurred.

The September report is signed by Captain Stueber without comment.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,093
Diarrhea	32
Dysentery	1
Indigestion	18
Gastritis	1
Not diagnosed	1
Malarial fever	176
Malaria	13
Tertian malaria	18
Typhoid and malarial typhoid	64
Other diseases	93
Total	417

The tabulated "numerical report" for the month deserves passing notice. It is as follows:

Remaining from last month	329
Returned to duty	141
Died	8
Discharged for disability	1
Remaining on sick report and in hospital	79
In quarters	57
On furlough	140

The October report is signed by Captain Stueber without comment.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,100
Malarial fever	233
Tertian malaria	10
Malaria	7
Diarrhea	14
Not diagnosed	1
Chronic gastritis	1
Typhoid and malarial typhoid	66
Other diseases	104
Total	436

We will now give a list of the possible typhoid cases in this regiment. In doing so we will give a complete medical history of each individual so far as such a history can be obtained from the regimental and hospital reports.

No. 1. Gastro-enteritis, May 20 to June 30. If this was a case of typhoid fever, the regiment brought the disease with them when they reached Chickamauga.

No. 2. Diarrhea, June 1 to 10. This may not have been a case of typhoid fever, but compared with the other diarrheas it was exceptionally prolonged.

No. 3. Diarrhea, June 10 to 27.

No. 4. Enteritis, June 16 to September 5. This case was sent to division hospital July 7 without diagnosis. In the hospital it was diagnosed as a case of enteritis.

No. 5. Typhoid fever, June 22; died July 3.

No. 6. Typhoid fever, July 1 to 27.

No. 7. Tertian malaria, July 2 to 31.

No. 8. Malarial typhoid, July 3; furloughed September 30.

No. 9. Malarial fever, without date; sent to division hospital July 4; returned to duty July 13.

No. 10. Tertian malaria, July 6; returned to duty July 21.

No. 11. Remittent malaria, without date; sent to division hospital July 6; returned to sick quarters July 22.

No. 12. Typhoid fever, July 7; still sick September 30.

No. 13. Dyspepsia, May 12 to 16; gastritis, July 11; sent to Sternberg Hospital, without date; still sick July 31. This name can not be found on the records of Sternberg Hospital.

No. 14. Typhoid fever, July 12; sick in quarters July 27. This man is reported with remittent malaria from September 19 to October 5.

No. 15. Diarrhea, July 13; sent to division hospital July 26; still sick July 31. There is no evidence on the record that this man was returned to duty.

No. 16. Diarrhea, July 14 to 25.

No. 17. Malarial fever, July 17; sent to division hospital August 22; furloughed August 23.

No. 18. Malarial typhoid fever, July 19; furloughed August 6.

No. 19. Tertian malaria, July 20; sent to division hospital July 21; furloughed August 20.

No. 20. Malarial fever, July 20; sent to division hospital July 21.

Here the diagnosis was changed to continued malaria, and the patient was furloughed August 12.

No. 21. Malarial fever, July 20; sent to division hospital July 21; still sick July 31. There is no record of this man having returned to duty.

No. 22. Malarial fever, July 21; in division hospital August 18. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 17.

No. 23. Typhoid fever, July 21; furloughed September 1.

No. 24. Malarial fever, July 21; sick in quarters July 31. There is no further record of this patient.

No. 25. Malarial typhoid, July 22 to August 18.

No. 26. Typhoid fever, July 22; died July 30.

No. 27. Typhoid fever, July 26; furloughed August 20.

No. 28. Typhoid fever, July 26; sent to division hospital August 3. Here the disease was diagnosed as malaria, and the patient was left on the sick list August 31. After this date the name does not occur.

No. 29. Intermittent fever, July 29; sent to division hospital July 31. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 10.

No. 30. Typhoid fever, July 29 to September 27.

No. 31. Malarial fever, August 2 to October 19.

No. 32. Typhoid fever, August 2; furloughed August 9; returned to duty October 18.

No. 33. Typhoid fever, August 2; furloughed September 8.

No. 34. Malarial fever, August 2; sent to Sternberg Hospital August 25. The diagnosis was changed to typhoid fever, and the patient was furloughed September 24.

No. 35. Malarial typhoid, August 2; sent to division hospital August 8; furloughed August 19.

No. 36. Malarial typhoid, August 2; furloughed August 20.

No. 37. Malarial fever, August 3; still sick August 31.

No. 38. Malaria, August 3 to 18.

No. 39. Malaria, August 3 to September 21.

No. 40. Malarial fever, August 4; sent to division hospital August 8. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 24.

No. 41. Malarial fever, August 4; furloughed August 23.

No. 42. Malarial fever, August 5; still sick August 31.

No. 43. Malarial fever, August 5; sent to division hospital August 6. Here the diagnosis was changed to enteric fever, and the patient was furloughed August 16.

No. 44. Malarial fever, August 5 to 30.

No. 45. Malarial fever, August 5 to 17.

No. 46. Typhoid fever, August 5; furloughed without date.

No. 47. Malarial fever, August 6; sent to division hospital August 8. Here the diagnosis was changed to typhoid fever. There is no record of the disposition of this patient.

No. 48. Malarial fever, August 7; furloughed August 23.

No. 49. Malarial fever, August 7; still sick August 31. There is no record of this man after the last-mentioned date.

No. 50. Typhoid fever, August 7; died August 31.

No. 51. Malarial fever, August 7; furloughed August 21.

No. 52. Indigestion, May 28 to 31; enteritis without date; sent to division hospital August 8; furloughed August 21.

No. 53. Gastro-enteritis, June 1 to 17.

No. 54. Malarial fever, August 8 to September 24.

No. 55. Malarial fever, August 8; furloughed August 21; returned to duty in October.

No. 56. Malarial fever, August 8 to September 21.

No. 57. Malarial fever, August 9; sent to division hospital August 9. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 24.

No. 58. Malarial fever, August 9; sent to division hospital August 20. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 3.

No. 59. Malarial fever, August 9; furloughed August 18.

No. 60. Malarial fever, August 10; furloughed August 19; not returned to duty October 31.

No. 61. Malarial fever, August 10; sent to Sternberg Hospital August 20. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 15.

No. 62. Typhoid fever, August 10; furloughed August 22.

No. 63. Malarial typhoid, August 10; furloughed September 5.

No. 64. Indigestion, May 18 to 20; malarial fever, August 10 to September 13.

No. 65. Malarial fever, August 10; sent to Sternberg Hospital August 20. Here the diagnosis was changed to continued malaria, and the patient was furloughed October 9.

No. 66. Malarial fever, August 11; furloughed August 24.

No. 67. Typhoid fever, August 12; furloughed August 21.

No. 68. Malarial typhoid, August 12; furloughed August 24. In Sternberg Hospital the diagnosis was changed to continued malaria.

No. 69. Malarial fever, August 13; furloughed August 24; returned to duty October 12.

No. 70. Malarial fever, August 13; sent to division hospital August 20. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 5. This man had malaria August 6 and 7.

No. 71. Malarial fever, August 13 to September 22.

No. 72. Malarial fever, August 13 to October 31.

No. 73. Malarial fever, August 13; sent to division hospital August 13. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 19.

No. 74. Malarial fever, August 13; still sick September 30.

No. 75. Malarial typhoid, August 13; furloughed September 2.

No. 76. Typhoid fever, August 13; sent to Sternberg Hospital without date. This man's name can not be found upon the records of the Sternberg Hospital.

No. 77. Malarial fever, August 14; sent to Sternberg Hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 2.

No. 78. Malarial fever, August 14; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was returned to duty September 11.

No. 79. Malarial fever, August 14 to September 30.

- No. 80. Malarial fever, August 14 to September 16.
 No. 81. Malarial fever, August 15; furloughed September 1. This man had indigestion May 14 to 18.
 No. 82. Typhoid fever, August 15; furloughed September 2.
 No. 83. Typhoid fever, August 15 to October 22.
 No. 84. Malarial fever, August 15; furloughed September 9.
 No. 85. Malarial fever, August 15 to 30.
 No. 86. Malarial fever, August 15 to September 30.
 No. 87. Malarial fever, August 15; still sick August 31.
 No. 88. Malarial fever, August 15; sent to division hospital August 29. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 17.
 No. 89. Malarial fever, August 16 to October 19.
 No. 90. Malarial fever, August 16 to September 24.
 No. 91. Typhoid fever, August 16; furloughed August 31.
 No. 92. Malarial fever, August 17; furloughed August 28.
 No. 93. Malarial fever, August 17; sent to division hospital August 23. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 1.
 No. 94. Malarial fever, August 17; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 9.
 No. 95. Typhoid fever, August 17; furloughed September 5.
 No. 96. Malarial fever, August 17 to September 21.
 No. 97. Malarial fever, August 17 to September 23.
 No. 98. Malarial fever, August 18; sent to division hospital without date. Here the disease was diagnosed as typhoid fever, and the patient was discharged October 8.
 No. 99. Malarial fever, August 18. The man was sent to division hospital without date. Here the disease was diagnosed as typhoid fever, and the patient was furloughed October 1.
 No. 100. Malarial fever, August 18; sent to Sternberg Hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 3.
 No. 101. Malarial fever, August 18; furloughed September 5.
 No. 102. Malarial fever, August 18 to October 15.
 No. 103. Malarial typhoid, August 18 to September 2.
 No. 104. Malarial typhoid, August 19; sent to Sternberg Hospital August 27. Here the diagnosis was changed to continued malaria, and the patient was furloughed October 20.
 No. 105. Malarial fever, August 19; sent to Sternberg Hospital August 27. Here the disease was diagnosed continued fever, and the patient was furloughed October 4. This man had dysentery May 27 to May 30.
 No. 106. Typhoid fever, August 19; died September 5.
 No. 107. Malarial fever, August 20; sent to Sternberg Hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 1.
 No. 108. Typhoid fever without date; sent to division hospital August 20; furloughed September 10.
 No. 109. Malarial fever, August 20; still sick October 31.
 No. 110. Malarial fever, August 20; sent to division hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 21.
 No. 111. Typhoid fever, August 20; no disposition given.
 No. 112. Malarial fever, August 20 to September 21.
 No. 113. Malarial fever, August 20; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 14. This man had malarial fever August 9 and 10.
 No. 114. Malarial fever, August 20; furloughed September 2.
 No. 115. Typhoid fever, August 20; furloughed August 29.
 No. 116. Malarial fever, August 20 to October 31.
 No. 117. Malarial fever, August 20; sent to division hospital August 25. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 16.
 No. 118. Typhoid fever, without date; sent to division hospital August 20; furloughed August 25.
 No. 119. Malarial fever, August 21 to September 30.
 No. 120. Malarial fever, August 21; sent to division hospital August 21. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 2.
 No. 121. Malarial fever, August 21; sent to Sternberg Hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 1.
 No. 122. Malarial fever, August 21; furloughed September 5.
 No. 123. Malarial fever, August 21; sent to division hospital August 21. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 3, and returned to duty October 9.
 No. 124. Typhoid fever, August 21; sent to Sternberg Hospital August 21, and furloughed October 4.
 No. 125. Malarial fever, August 22 to September 12.
 No. 126. Malarial fever, August 22; sent to Sternberg Hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 17.
 No. 127. Malarial fever, August 22 to October 13.
 No. 128. Typhoid fever, August 22; furloughed from hospital September 22.
 No. 129. Malarial fever, August 22; furloughed September 2.
 No. 130. Typhoid fever, August 22; furloughed September 23.
 No. 131. Malarial fever, August 22; sent to division hospital August 26. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 5.
 No. 132. Malarial fever, August 23; sent to division hospital August 26. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 2.
 No. 133. Diarrhea, August 23; sent to division hospital August 23. Here the diagnosis was changed to remittent malaria, and the patient was furloughed September 5.
 No. 134. Dysentery, August 23 to September 27.
 No. 135. Malarial fever, August 23; sent to division hospital August 25. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 11. This man had malarial fever August 13, and the record is left incomplete at this point.
 No. 136. Malarial fever, August 23 to September 28.
 No. 137. Continued malaria, without date; sent to division hospital August 23; furloughed August 27.
 No. 138. Typhoid fever, August 24; died September 1.
 No. 139. Malarial fever, August 24; sent to division hospital August 30. Here the diagnosis was changed to typhoid fever, and the patient died September 8.
 No. 140. Malarial fever, August 24; sent to division hospital August 30. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 21. This man is recorded as having had malaria August 20, and this record is left incomplete.
 No. 141. Malarial fever, August 25; furloughed September 2.
 No. 142. Typhoid fever, August 26; died September 17.
 No. 143. Malarial fever, August 26; sent to division hospital August 29. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 24.
 No. 144. Malarial fever, August 26; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 2. He returned to duty October 4.
 No. 145. Diarrhea, August 26 to September 30.
 No. 146. Malarial fever, August 26 to October 31.
 No. 147. Malarial fever, August 26; sent to Sternberg Hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 1.
 No. 148. Malarial fever, August 26; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed November 14.
 No. 149. Diarrhea, August 26; sent to division hospital August 29. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 27.
 No. 150. Typhoid fever, without date; sent to division hospital August 27; furloughed September 1.

No. 151. Typhoid fever, without date; sent to division hospital August 27; furloughed September 2.

No. 152. Malarial typhoid, August 27; furloughed September 5.

No. 153. Malarial fever, August 27; sent to Sternberg Hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 2.

No. 154. Diarrhea, August 27; still sick September 30.

No. 155. Malarial typhoid, August 27; furloughed September 2.

No. 156. Malarial typhoid, August 27; furloughed September 1.

No. 157. Malarial fever, August 27; sent to Sternberg Hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 4.

No. 158. Remittent malaria, August 27; sent to division hospital August 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 2.

No. 159. Malarial fever, August 27; sent to division hospital August 30. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 19.

No. 160. Typhoid fever, August 27; furloughed October 12.

No. 161. Typhoid fever, without date; sent to division hospital August 27; furloughed September 1. This man was a hospital steward.

No. 162. Malarial typhoid, August 28; furloughed September 3.

No. 163. Malaria, August 28; sent to Sternberg Hospital August 28. Here the diagnosis was changed to typhoid fever and the patient was furloughed September 1.

No. 164. Malarial fever, August 29; sent to division hospital August 29. Here the diagnosis was changed to typhoid fever. The hospital disposition of this patient is not given.

No. 165. Malarial fever, August 29; sent to division hospital August 30. Here the diagnosis was changed to typhoid fever and the patient was furloughed September 22.

No. 166. Malarial fever, August 29; sent to division hospital August 29. Here the diagnosis was changed to typhoid fever and the patient was furloughed September 21.

No. 167. Malarial fever, August 30 to October 13.

No. 168. Typhoid fever, August 30; furloughed from hospital September 27.

No. 169. Malarial typhoid, August 30; furloughed from hospital October 19. This man is recorded as having had malarial fever August 22, but this record is left incomplete.

No. 170. Malarial fever, August 31; furloughed September 6.

No. 171. Malarial fever, August 31; furloughed September 6.

No. 172. Malarial fever, August 31; furloughed September 6.

No. 173. Malarial fever, September 1 to October 1.

No. 174. Malarial fever, September 1; sent to division hospital September 19. Here the disease was diagnosed typhoid fever and the patient was furloughed without date.

No. 175. Remittent malaria, September 1 to October 5.

No. 176. Malarial fever, September 1; sent to division hospital September 2. Here the diagnosis was changed to typhoid fever and the patient was furloughed September 6.

No. 177. Malarial fever, September 1; still sick October 31.

No. 178. Malarial fever, September 1 to 21.

No. 179. Malarial fever, September 1; sent to division hospital September 10. Here the disease was diagnosed typhoid fever and the patient was furloughed October 29.

No. 180. Diarrhea, September 1 to 12.

No. 181. Malarial fever, September 1; furloughed October 3.

No. 182. Malarial fever, September 1 to 16.

No. 183. Typhoid fever, September 1 to October 14.

No. 184. Typhoid fever, September 1; furloughed September 6.

No. 185. Malarial fever, September 1 to October 5.

No. 186. Diarrhea, August 26 to 31; typhoid fever, September 1; furloughed September 22.

No. 187. Indigestion, September 2 to 27; indigestion October 6 to 16.

No. 188. Malarial fever, September 2; still sick October 31.

No. 189. Malarial fever, September 2 to October 14.

No. 190. Malarial fever, September 2 to October 19.

No. 191. Malarial fever, September 2 to October 12.

No. 192. Malarial fever, September 2; still sick October 31.

No. 193. Indigestion, May 11 and 12; typhoid fever, September 2; furloughed October 5.

No. 194. Malarial fever, September 2; still sick October 31.

No. 195. Malarial fever, September 3; still sick October 31.

No. 196. Malaria, August 20; left incomplete; malarial fever, September 3 to October 6.

No. 197. Malarial fever, September 3; still sick October 31.

No. 198. Typhoid fever, September 3; still sick October 31.

No. 199. Malarial fever, September 3; sent to division hospital September 10. Here the diagnosis was changed to typhoid fever and the patient was furloughed September 22.

No. 200. Typhoid fever, September 3; furloughed September 6.

No. 201. Malarial fever, September 3; still sick October 31.

No. 202. Malarial typhoid, September 4; furloughed September 24.

No. 203. Malarial fever, September 4; still sick October 31.

No. 204. Diarrhea, September 4 to 22.

No. 205. Malarial fever, September 4; still sick October 31.

No. 206. Malarial fever, September 5; still sick October 31.

No. 207. Malarial fever, September 5; furloughed September 24.

No. 208. Malarial fever, September 5; sent to division hospital September 5. Here the diagnosis was changed to typhoid fever and the patient was furloughed November 15.

No. 209. Malarial fever, September 5; sent to division hospital without date. Here the diagnosis was changed to typhoid fever and the patient was furloughed November 4.

No. 210. Diarrhea, September 5; still sick October 31.

No. 211. Malarial fever, September 5; sent to division hospital September 21. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 13.

No. 212. Malarial fever, September 5 to 21.

No. 213. Malarial fever, September 5; still sick October 31.

No. 214. Typhoid fever, September 5; furloughed September 6.

No. 215. Typhoid fever, September 5; died September 9.

No. 216. Diarrhea, September 6; sent to division hospital September 12. Here the diagnosis was changed to typhoid fever and the patient was furloughed September 20.

No. 217. Malarial fever, September 6; still sick October 31.

No. 218. Malarial fever, September 6 to October 23.

No. 219. Malarial fever, September 7; sent to division hospital September 8. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 5.

No. 220. Malarial fever, September 7; still sick October 31.

No. 221. Malarial fever, September 7; still sick October 31.

No. 222. Typhoid fever, September 7; still sick October 31.

No. 223. Malarial fever, September 8; still sick October 31.

No. 224. Malarial fever, September 8 to 28.

No. 225. Malarial fever, September 8; sent to division hospital September 12. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 3.

No. 226. Typhoid fever, September 8; furloughed October 5.

No. 227. Malarial fever, September 9; still sick October 31.

No. 228. Malarial fever, September 9; still sick October 31.

No. 229. Malarial fever, September 9; still sick October 31.

No. 230. Malarial fever, September 9 to October 19.

No. 231. Malarial fever, September 9; sent to division hospital without date. Here the diagnosis was changed to typhoid fever and the patient was furloughed November 11.

No. 232. Malarial fever, September 9 to October 11.

No. 233. Typhoid fever, September 9; furloughed October 17.

No. 234. Typhoid fever, September 9; died September 20.

No. 235. Malarial fever, September 9; still sick October 31.

No. 236. Malarial fever, without date; sent to division hospital September 9; returned to duty September 20.

No. 237. Typhoid fever, without date; sent to division hospital August 25; furloughed September 3.

- No. 238. Typhoid fever, September 10; died October 2.
- No. 239. Indigestion, September 10 to 25.
- No. 240. Malarial fever, September 10; still sick October 31.
- No. 241. Malarial fever, September 10 to 21.
- No. 242. Malarial fever, September 10; sent to division hospital September 22. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 14.
- No. 243. Indigestion, September 11 to October 3.
- No. 244. Malarial fever, September 11 to October 25.
- No. 245. Typhoid fever, September 11; died October 2.
- No. 246. Malarial fever, September 11; sent to division hospital without date. Here the diagnosis was changed to typhoid fever and the patient was returned to duty October 3.
- No. 247. Malarial fever, September 11; sent to division hospital without date. Here the diagnosis was changed to typhoid fever and the patient was furloughed September 29.
- No. 248. Malarial fever, September 11 to October 20.
- No. 249. Malarial fever, September 11; still sick October 31.
- No. 250. Malarial fever, September 11; still sick October 31.
- No. 251. Diarrhea, September 11; still sick October 31.
- No. 252. Malarial fever, September 11 to 28.
- No. 253. Typhoid fever, September 12; furloughed October 24.
- No. 254. Indigestion, September 12 to 30.
- No. 255. Diarrhea, September 12; still sick October 31.
- No. 256. Malarial fever, September 13 to October 5.
- No. 257. Malarial fever, September 13; sent to division hospital September 14. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 3.
- No. 258. Typhoid fever, September 13; furloughed October 17.
- No. 259. Malarial fever, September 13 to October 30. This man is recorded as having had malarial fever September 10, and this record is left incomplete.
- No. 260. Malarial fever, September 13; still sick October 31.
- No. 261. Malarial fever, September 13; still sick October 31.
- No. 262. Malarial fever, September 13; sent to division hospital September 13. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 5.
- No. 263. Typhoid fever, September 13; disposition not given.
- No. 264. Indigestion, September 13 to October 8.
- No. 265. Typhoid fever, September 13; furloughed October 12.
- No. 266. Malarial fever, September 13; still sick October 31.
- No. 267. Malarial fever, without date; sent to division hospital September 13. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 20. This man had colic May 21 to 30.
- No. 268. Typhoid fever, without date; sent to division hospital September 13; furloughed September 30.
- No. 269. Typhoid fever, September 14; died September 27.
- No. 270. Malarial fever, September 14; furloughed September 25.
- No. 271. Malarial fever, September 14; furloughed October 16.
- No. 272. Malarial fever, September 14; sent to division hospital September 16. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 14. This man had dyspepsia May 25 to 29.
- No. 273. Typhoid fever, September 14; died October 2.
- No. 274. Typhoid fever, September 14; died September 28.
- No. 275. Malarial fever, September 14 to October 22.
- No. 276. Malarial fever, September 14; still sick October 31.
- No. 277. Typhoid fever, September 14; furloughed October 24.
- No. 278. Malarial fever, September 15; sent to division hospital September 29. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 24.
- No. 279. Typhoid fever, September 15; furloughed October 5.
- No. 280. Malaria, September 15; sent to division hospital September 16. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 1.
- No. 281. Typhoid fever, September 15; furloughed October 14.
- No. 282. Malarial fever, September 15; furloughed October 10.
- No. 283. Malarial fever, September 15 to 26.
- No. 284. Malarial fever, September 15; sent to division hospital September 16. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 1.
- No. 285. Malaria, September 16; sent to division hospital September 16. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 14.
- No. 286. Typhoid fever, September 16; furloughed October 5. This man had indigestion May 17 to 20.
- No. 287. Malarial fever, September 16; sent to division hospital September 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 19.
- No. 288. Diarrhea, September 16 to October 4.
- No. 289. Malarial fever, September 16; sent to division hospital September 30. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 28.
- No. 290. Malarial fever, September 16; furloughed October 5.
- No. 291. Indigestion, September 16 to October 1.
- No. 292. Malarial fever, September 16; sent to division hospital September 16. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 28.
- No. 293. Typhoid fever, without date; sent to division hospital November 8; furloughed November 13.
- No. 294. Malarial fever, September 17, furloughed October 5.
- No. 295. Malarial fever, September 17, furloughed October 5.
- No. 296. Malarial fever, September 17; sent to division hospital September 17. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 29.
- No. 297. Malarial fever, September 17; furloughed October 23.
- No. 298. Malarial fever, September 18; sent to division hospital September 19. Here the diagnosis was changed to enteric fever, and the patient was furloughed October 24.
- No. 299. Malarial fever, September 18; furloughed October 19.
- No. 300. Malarial fever, September 18; furloughed October 5.
- No. 301. Malarial fever, September 18 to October 6.
- No. 302. Malarial fever, September 18; still sick October 31.
- No. 303. Malarial fever, September 18; still sick October 31.
- No. 304. Malarial fever, September 18; still sick October 31.
- No. 305. Diarrhea, September 19; still sick October 31.
- No. 306. Diarrhea, September 19; still sick October 31.
- No. 307. Typhoid fever, September 19; furloughed October 14.
- No. 308. Typhoid fever, September 19; furloughed October 19.
- No. 309. Malarial fever, September 19; sent to division hospital September 23. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 7.
- No. 310. Malarial fever, September 19 to 30.
- No. 311. Diarrhea, September 19 to October 5.
- No. 312. Malarial fever, September 19 to 30.
- No. 313. Malarial fever, September 19; sent to division hospital September 23. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 27.
- No. 314. Malarial fever, September 19; still sick October 31.
- No. 315. Malarial fever, September 19 to October 27.
- No. 316. Malarial fever, September 19; still sick October 31.
- No. 317. Malarial fever, September 20 to October 4.
- No. 318. Typhoid fever, September 20 to October 31.
- No. 319. Typhoid fever, September 20; furloughed November 20. This man had dysentery May 24 and 25.
- No. 320. Malarial fever, September 20 to October 18.
- No. 321. Malarial fever, September 21; furloughed October 1.
- No. 322. Malarial fever, September 21; sent to division hospital September 23. Here the disease was diagnosed as typhoid fever, and the patient was furloughed October 10.
- No. 323. Malarial fever, September 21; furloughed October 7.
- No. 324. Typhoid fever, September 21; furloughed October 19.
- No. 325. Malarial fever, September 21 to October 27.
- No. 326. Malarial fever, September 22; still sick October 31.
- No. 327. Diarrhea, September 22; still sick October 31.
- No. 328. Typhoid fever, September 23; furloughed October 24.
- No. 329. Malarial fever, September 23 to October 8.

No. 330. Malarial fever, September 24; sent to division hospital September 24. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 14.

No. 331. Diarrhea, September 24; still sick October 31. This man had indigestion May 26 to 31.

No. 332. Malarial fever, September 25; still sick October 31.

No. 333. Malarial fever, September 25; sent to division hospital September 27. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 14.

No. 334. Malarial fever, September 26; sent to division hospital September 29. Here the diagnosis was changed to typhoid fever, but the disposition of the patient is not given.

No. 335. Malarial fever, September 26; sent to division hospital September 28. Here the diagnosis was changed to typhoid fever, and the patient was discharged some time in November.

No. 336. Typhoid fever, September 26; furloughed October 24.

No. 337. Typhoid fever, September 26; still sick October 31. This case was first diagnosed as indigestion.

No. 338. Typhoid fever, September 26; furloughed October 17.

No. 339. Malarial fever, August 29; sent to division hospital August 30. Here the diagnosis was changed to typhoid fever and the patient was furloughed September 21.

No. 340. Malarial fever, September 27 to October 21.

No. 341. Malarial typhoid, September 27; furloughed October 19.

No. 342. Malarial fever, September 27; sent to division hospital September 29. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 17.

No. 343. Malarial fever, September 27; still sick October 31.

No. 344. Indigestion, September 28; sent to division hospital October 4. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 24.

No. 345. Malarial fever, September 28; still sick October 31.

No. 346. Malarial fever, September 28; sent to division hospital September 28. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 14.

No. 347. Typhoid fever, September 28; still sick October 31.

No. 348. Malarial fever, September 28; still sick October 31.

No. 349. Malarial fever, September 30; sent to division hospital September 30. Here the diagnosis was changed to typhoid fever and the patient returned to duty October 30.

No. 350. Malarial fever, September 30 to October 15.

No. 351. Typhoid fever, without date; sent to division hospital October 1; furloughed October 17.

No. 352. Typhoid fever, October 1; furloughed October 24.

No. 353. Indigestion, October 1 to 16.

No. 354. Diarrhea, October 1; furloughed October 14.

No. 355. Typhoid fever, October 1; sent to Fort Meyer November 20.

No. 356. Malarial fever, October 2 to 19.

No. 357. Malarial fever, October 3 to 18.

No. 358. Typhoid fever, October 3; furloughed October 17.

No. 359. Indigestion, October 3 to 14.

No. 360. Indigestion, October 4; sent to division hospital October 10. Here the diagnosis was changed to remittent malaria and the patient was furloughed October 24.

No. 361. Typhoid fever, October 4; furloughed without date.

No. 362. Typhoid fever, October 4; furloughed November 20.

No. 363. Indigestion, October 5 to 19.

No. 364. Malaria, October 6 to 20.

No. 365. Malaria, October 6 to 24.

No. 366. Malaria, October 6; furloughed October 19.

No. 367. Malaria, October 6; furloughed November 1.

No. 368. Malaria, October 6; sent to division hospital October 15. Here the diagnosis was changed to typhoid fever and the patient was furloughed November 15.

No. 369. Malarial fever, October 6 to 22.

No. 370. Malarial fever, October 7; sent to division hospital October 13. Here the diagnosis was changed to typhoid fever and the patient was furloughed November 13.

No. 371. Malarial fever, October 7 to 26.

No. 372. Malarial fever, October 7 to 20. This man had malarial fever September 14, and there is no record of his return to duty after that time, but on October 7 his name occurs as having been admitted to sick report on that date.

No. 373. Malarial fever, October 8; sent to division hospital October 18. Here the diagnosis was changed to typhoid fever and the patient was furloughed November 8.

No. 374. Malarial fever, October 11; still sick October 31. This man had diarrhea September 3 to 5.

No. 375. Malarial fever, October 12; sent to division hospital October 15. Here the diagnosis was changed to typhoid fever and the patient was furloughed November 8.

No. 376. Malarial fever, October 13 to 23.

No. 377. Malarial fever, October 16; still sick October 31.

No. 378. Diarrhea, October 16 to 28.

No. 379. Malarial fever, October 17; still sick October 31.

No. 380. Malarial fever, October 17; furloughed November 15.

No. 381. Malarial fever, October 18; sent to division hospital October 18. Here the diagnosis was changed to typhoid fever, and the patient was furloughed November 8.

No. 382. Diarrhea, October 19; still sick October 31.

No. 383. Typhoid fever, October 19; furloughed November 21.

No. 384. Malarial fever, October 19; sent to division hospital October 24. Here the diagnosis was changed to typhoid fever, and the patient was furloughed November 15.

No. 385. Typhoid fever, October 20; still sick October 31.

No. 386. Malarial fever, October 20; still sick October 31.

No. 387. Diarrhea, October 21; still sick October 31.

No. 388. Malarial fever, October 22; sent to division hospital October 25. Here the diagnosis was changed to typhoid fever, and the patient was furloughed November 23.

No. 389. Typhoid fever, October 22; furloughed November 28.

No. 390. Malarial fever, October 22; sent to division hospital October 31. Here the diagnosis was changed to typhoid fever, and the patient was sent to Fort Myer, November 20.

No. 391. Typhoid fever, October 23; sent to Fort Myer, November 20.

No. 392. Malarial fever, October 25; still in hospital November 30.

No. 393. Malarial fever, October 25; still sick in hospital November 30.

No. 394. Malarial fever, October 25; still sick in hospital November 30.

No. 395. Indigestion, October 25; still sick in hospital November 30.

No. 396. Malarial fever, October 26; still sick November 30.

No. 397. Typhoid fever, October 26; furloughed November 23. This man had diarrhea May 13 to 16.

No. 398. Indigestion, October 28; still sick in hospital November 30.

No. 399. Malarial fever, October 28; still sick in hospital November 30. This man had indigestion May 20 to 23.

No. 400. Malarial fever, October 29; still sick in hospital November 30.

No. 401. Typhoid fever, November 10; sent to Fort Myer, November 20.

No. 402. Typhoid fever, November 12; furloughed November 15. This man is reported as being convalescent from typhoid fever at the time of his admission to the hospital; however, we can find neither in regimental nor hospital reports any record of this man previous to November 12.

No. 403. Malarial fever, without date; sent to division hospital October 8. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 29.

SUMMARY.

Assembled at Columbus, Ohio, in April, 1898.

Mustered into United States service May 10, 1898.

Arrived at Chickamauga Park May 18, 1898.

Strength on arrival, 815.

Date of first case of probable typhoid fever, May 20, 1898.
 Date of first case of recognized typhoid fever, June 22, 1898.
 Left Chickamauga Park August 28, 1898.
 Strength on departure, 1,297.

Number of cases of probable typhoid fever developed at Chickamauga	160
Number of cases of protracted fever developed at Knoxville:	
From August 29 to 31.....	11
During September.....	178
During October.....	54
Total number of cases of protracted fever developed in the Second Ohio Volunteer Infantry	403
These 403 cases were diagnosed as follows:	
Typhoid fever.....	192
Malaria.....	170
Diarrhea.....	23
Gastritis.....	17
Enteritis.....	1
Total.....	403

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Ausman, Charles E....	Pvt., M.	1898 Sept. 27	Knoxville, Tenn.	Typhoid.
Bloom, William H....	Pvt., G.	Aug. 23	Camp Thomas, Ga.	Apoplexy.
Cole, Jesse R.....	Pvt., B.	Aug. 31	Chickamauga, Ga.	Typhoid.
Dinehart, William....	Pvt., I.	Oct. 2	Camp Poland, Tenn.	Enteric fever.
Dunson, Edward W....	Pvt., G.	Sept. 8	Knoxville, Tenn.	Typhoid and perforation.
Fisher, Jacob.....	Pvt., D.	Oct. 2	Knoxville, Tenn., Camp Poland.	Typhoid.
Gottfried, John.....	Pvt., C.	Sept. 28	Knoxville, Tenn.	Do.
Grummel, Frank J....	Pvt., E.	Sept. 7	Chickamauga, Ga.	Typhoid malaria.
Mayers, Elmer E.....	Pvt., L.	July 2	.....	Enteric fever.
Messer, Earl L.....	Pvt., E.	Sept. 6	Tiffin, Ohio.	Do.
Potts, Dort.....	Pvt., D.	Aug. 31	Chickamauga, Ga.	Typhoid.
Shaffer, Ora L.....	Pvt., M.	Sept. 9	Knoxville, Tenn.	Do.
Wood, Thomas W.....	Pvt., M.	Sept. 20	do.	Enteric fever.
Wurts, Edward F.....	Pvt., B.	July 30	Camp Thomas, Ga.	Typhoid.

Total deaths.....	14
Deaths due to typhoid fever.....	13
Percentage of deaths among cases of protracted fever (403), 3.22	
Percentage of deaths among cases of recognized typhoid fever (192), 6.77.	

ADDENDUM TO THE SECOND DIVISION.

The Third North Carolina Volunteer Infantry was sent to Knoxville about the middle of September and there became a part of this division. A brief history of this regiment is attached hereto for the reasons detailed in the history.

THIRD NORTH CAROLINA VOLUNTEER INFANTRY.

This was a regiment of colored troops, mustered into service at Fort Macon, N. C., on July 19, 1898.

The first report covers the last part of July.

CONDENSED SICK REPORT FOR JULY 20 TO 31.

Mean strength	1,098
Admissions:	
From command.....	6
Total to be accounted for	6
Completed cases.....	0

The August report is signed by Major Dellinger, who makes the following remarks:

The prevailing diseases of this command will be seen to be malarial fever and bowel troubles, such as dysentery, diarrhea, etc. The malarial fever is, for the most part, a very mild variety. Less than half a dozen cases have shown symptoms of a malignant type. All have yielded gracefully to treatment save two cases still remaining—one in quarters and the other in hospital. As to cause, the malaria is probably due to a marsh lying to the west and north of the camp, which is alternately covered by the ebb and flow of the tide. But, doubtless, the fact of the prevailing winds, southwest, coming directly off the ocean, and the further fact of the sandy soil, so thoroughly filtering water, account for our not having had more of this trouble.

The guards lie down on the sand and sleep at night, sometimes reporting a chill the next morning. As to the bowel diseases, they are, for the most part, doubtless due to overeating. They grow beautifully less as the command grows older. As the night winds from the sea begin to grow colder, catarrhal troubles begin to manifest themselves. As a precautionary measure, the entire camp and surroundings are carefully policed. Special attention is given to the condition of the cooking places and the preparation of the food. The wells are systematically drained once a week. The water supply is good and abundant.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,098
Admissions:	
Remaining from last month	6
From command	41
Total	47
Completed cases.....	28
Returned to duty.....	24
Discharged	4
Total	28
Remaining on sick report:	
Hospital	9
Quarters.....	10
Total	19

In the September report Major Dellinger makes the following remarks:

The command remained at Fort Macon, N. C., until the morning of September 14, at which time it left for Camp Poland, Knoxville, Tenn., arriving at the latter place on the evening of September 15, where it encamped in three different camp sites. On the morning of the 15th, on the Western North Carolina Railroad at Azales Switch, near Biltmore, N. C., the second section of our train was wrecked by an open switch, resulting in the injury of nine soldiers. None of these injuries were fatal. However, several were more or less serious. There were no fractures or dislocations. We brought to Knoxville only two sick men; one had typhoid fever and the other malarial fever. On our arrival at Knoxville we were kept practically out of doors for eighty-four hours awaiting orders where to pitch camp. We were afterwards moved to a camp site recently vacated by a regiment which had seen sickness at Chickamauga. Here we spent quite a week, during a large part of which it rained. The ground was wet and we had no floors in the tents. The water which was supplied from the city waterworks was cut off from time to time, making it necessary for our men to use spring water, which had been forbidden them, and the hydrant water is said to have been condemned. We have experienced great difficulty in securing lime for the sinks; nearly a week passed and none could be obtained, notwithstanding the fact that requisition after requisition was made for it by the surgeon in charge. This, I think, is sufficient to account for the epidemic of diarrhea which attacked our officers and men while on this site. We now occupy a more

healthy site and our sickness is now 100 per cent less. All the cooking is still done out of doors on account of there being no lumber with which to build kitchens.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,096
Admissions:	
Remaining from last month	16
From command	119
Total	135
Completed cases	56
Returned to duty	55
Died	1
Total	56
Remaining on sick report:	
Hospital	10
Quarters	54
Total	64

In the October report Major Dellinger makes the following remarks:

There is nothing of special importance to be said in connection with this report further than the fact that 80 or 90 per cent of the men's tents leak; and this, taken together with the further fact that they have only camp fires for heating purposes, accounts for a great deal of catarrhal trouble among the men. This is especially true of men who are from eastern North Carolina, where a semi-tropical climate obtains. The men from the western section of the State stand the cold better. Better quarters must be provided.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,090
Admissions:	
Remaining from first month	64
From command	144
Total	208
Completed cases	169
Returned to duty	96
Died	4
Otherwise disposed of	69
Total	169
Remaining on sick report:	
Hospital	18
Quarters	21
Total	39

The November report is signed by Major Dellinger with the following remarks:

Only the expected has happened this month, so to speak. The most trouble we were expecting was from influenza, pneumonia, and kindred affections. But for our timely removal from Camp Poland, Knoxville, Tenn., we must have suffered far more from these troubles. And still this advantage was somewhat mitigated by the cold wave which struck here about the time we did, so early in fact that we had not time to put up tents and provide them with floors, consequently the men suffered much. Catarrhal jaundice is still among the men. Several of the officers have been attacked. There are no deaths from this cause. Much complaint has reached this department concerning the bread supply of this camp. It was said to be deficient in quantity and quality. Several loaves were left for my inspection, probably some of the worst, but wholly

unfit for human consumption. I understand recently that the contract has been changed and have heard no further complaint. The tentage is very bad. The men have to throw their ponchos over their tents to keep out rain. Of course this is not altogether a success. This is a serious matter, and should be attended to at once, or the men must continue being seriously damaged in constitution from this source of avoidable exposure. There have been no sick in regimental hospital during the month.

CONDENSED SICK REPORT FOR NOVEMBER.

Mean strength	1,084
Admissions:	
Remaining from last month	21
From command	51
Total	72
Completed cases	51
Returned to duty	17
Died	2
Transferred to other hospitals	32
Total	51
Remaining on sick report:	
Hospital	0
Quarters	32

In the December report Major Dellinger makes the following remarks:

The entire command has been vaccinated during this month. The great majority of these vaccinations were successful. The health of the command is much improved over that of last month and continues to improve.

CONDENSED SICK REPORT FOR DECEMBER.

Mean strength	1,071
Admissions:	
Remaining from last month	21
From command	49
Total	70
Completed cases	48
Returned to duty	29
Died	2
Discharged	3
Transferred	14
Total	48
Remaining sick in quarters	22

We inspected this regiment a few days after it reached Knoxville. The statement of the surgeon that the guards were accustomed to lie on the sand and sleep at night very naïvely expresses the lack of discipline in this command. There are several points of interest in the history of this regiment. In the first place, typhoid fever appeared long before the regiment left its State encampment. Indeed, the first case of typhoid fever had its initial date July 12, seven days before the regiment was mustered into the service of the United States. The command had had no less than 16 cases of typhoid fever before it went to Knoxville. Had it remained at Fort Macon, N. C., the number of cases of typhoid fever would probably have been no less. Only one case was diagnosed typhoid fever by the regimental surgeon, and this case occurred on the 11th of October. It will be

seen, therefore, that typhoid fever had become widely spread in the regiment before it was recognized. Nineteen cases from this regiment were recognized as typhoid fever after transfer to the hospital. In all, there were 58 cases of undoubted typhoid fever in the regiment, with 7 deaths. The fact that a number of cases of typhoid fever was not larger appears to us to be interesting. As we have already seen, the location of the troops at Knoxville was exceptionally good. In fact it would seem that no better place from a sanitary standpoint could possibly have been selected. The water was unobjectionable and was abundant in quantity. We are quite thoroughly convinced that the chief agent in the distribution of typhoid fever at Knoxville was the fly, and in our opinion this regiment escaped as lightly as it did because it did not go to this general encampment until the middle of September, and the cool weather soon materially lessened the activity of the fly. In our opinion, the history of this regiment is suggestive of this one fact and nothing more. It is possible that later in the season other factors than the fly may have had something to do with the spread of typhoid fever in this and other regiments. It is probable that tents, blankets, and clothes became infected. In this way we may account for a number of cases that occurred in November. The last three cases of typhoid fever reported from this regiment had their initial date on November 19. Two of these three cases belonged to the same company; in fact, the tendency of the disease to group itself in companies is quite as marked in this command as in others. We have called attention to this regiment for the express purpose of using it as evidence of the influence of the fly in the distribution of typhoid fever. We believe that if this regiment had been sent to Chickamauga earlier in the summer it would have suffered quite as severely from typhoid fever as any other.

COMMUNICATIONS FROM THE SURGEONS OF THE THIRD NORTH CAROLINA VOLUNTEER INFANTRY.

Medical officers.

James E. Dellinger, major and surgeon, Greensboro, N. C.
Manassa T. Pope, lieutenant and assistant surgeon, Charlotte, N. C.
Marcus W. Alston, lieutenant and assistant surgeon, Asheville, N. C.

Major Dellinger sends the following communication:

I can not reply to your communication without some direct contradictions of what apparently seems fact to you, and that I do not care to do. For instance, you say in your history of our regiment that we had 16 cases of typhoid fever before we left Fort Macon, N. C. Now, according to my best knowledge and belief this is not true. There were 3 cases which occurred there, and these were at first taken for malarial fever and were so reported, but afterwards I had reason to believe them typhoid fever. With these excepted, the official reports are correct so far as the condition obtained at Macon, N. C.

At the other camps, at Knoxville and Macon, in compliance with order from the chief surgeon, all cases of continuous temperature of 102° and above for twenty-four hours, or may be forty-

eight hours, were sent to division hospital; hence the meager chance for a settled diagnosis in any case of fever at the regimental hospital, a luxury denied our regiment, the Third North Carolina Volunteer Infantry, until it reached Macon, Ga.

As to the fly theory, I am perfectly in accord, and I may say with sufficient modesty that it was advocated by me in an address before the North Carolina Teachers' Association in the early part of June, 1898, and was my faith and practice before the disaster at Chickamauga. May it not be said that we might have had more typhoid but for this practice at Fort Macon, N. C.? The official reports at other points tell the whole truth, so far as my knowledge and experience could make them true; hence there is nothing I might add to increase the accuracy of your final report.

Comment: It is barely possible that we have over-estimated the number of cases of typhoid fever in this regiment before it left North Carolina. However, from the regimental records as prepared by Major Dellinger we will give a few of these cases that we have classed as probable typhoid fever:

No. 1. Private Mitchell, Company F, malaria, July 12 to August 22.

No. 2. Corporal McMunier, Company E, malaria, August 2; still sick in hospital at Knoxville November 15.

No. 3. Private Younger, Company D, malaria, August 2; had not returned to duty December 30.

No. 4. Private Rogers, Company I, malaria, August 8; had not returned to duty December 30.

No. 5. Private Hill, Company F, diarrhea, September 11 to October 13.

No. 6. Private Ballard, Company A, malaria, September 1; still sick in hospital December 18.

These are illustrations of the cases that we have marked as probable typhoid fever in the regiment before it left North Carolina.

REPORTS FROM THE SECOND DIVISION HOSPITAL, FIRST ARMY CORPS.

The first report from this hospital covers the period from June 15 to 30, inclusive. In this report Maj. Fred R. Charlton, surgeon in charge, makes the following statement:

The prevailing diseases are malaria, measles, gastro-intestinal diseases, with quite a number of cases of ischio-rectal abscess. The cases of measles are isolated.

CONDENSED SICK REPORT FROM JUNE 15 TO 30.

Mean strength	11,357
Typhoid fever.....	7
Malarial fever.....	32
Intestinal disorders.....	22
Other diseases.....	96
Total.....	157
Admissions:	
From command.....	160
Total to be accounted for.....	160
Completed cases.....	82
Returned to duty.....	77
Transferred to other hospitals.....	5
Total.....	82

CONDENSED SICK REPORT FOR JULY.

Mean strength	11,342
Typhoid fever	43
Malarial fever.....	103
Intestinal disorders.....	68
Other diseases.....	198
Total	412

The August report is signed by Maj. H. B. Baguley, surgeon in charge, who makes the following remarks:

The prevailing disease is typhoid fever; mortality low.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	10,278
Typhoid fever.....	127
Malarial fever.....	255
Intestinal disorders.....	86
Other diseases.....	192
Total	660

The September report is signed by Major Baguley, and in this he makes the following statement:

The prevailing disease is typhoid fever, and it is the opinion of the surgeon in charge that many of the cases diagnosed as malarial remittent in this report should have been typhoid fever, as in no case where microscopic analysis of the blood has been made has the plasmodium been found. The cases marked enteric fever were changed to typhoid fever by direction of the surgeon in charge.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	8,542
Typhoid fever.....	279
Malarial fever.....	321
Intestinal disorders.....	49
Other diseases.....	154
Total	803

The October report is signed by Major Baguley without comment.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	8,432
Typhoid fever.....	229
Malarial fever.....	104
Intestinal disorders.....	32
Other diseases.....	118
Total	483

The November report is signed by Major Kendall, surgeon in charge, who makes the following statements:

During the month of November, fewer cases of typhoid fever have appeared. Several cases of pneumonia have occurred, attributable perhaps to the exposure, which was considerable during the early winter before present arrangements had been completed. Later there have occurred several cases of cerebro-spinal meningitis, with one death at this hospital. The surgeons of the hospital have commented upon what seemed to all to be a fact, viz, the comparative ease with which pneumonia was borne, for though in many cases the temperature reached $104\frac{1}{2}^{\circ}$ and 105° , there were no deaths. There have been a few cases of measles in the command, the general health of which has been excellent.

CONDENSED SICK REPORT FOR NOVEMBER.

Mean strength	2,113
Typhoid fever.....	196
Malarial fever.....	12
Intestinal disorders.....	15
Other diseases.....	172
Total	395

We fear that these reports will mislead unless we call attention to the fact that cases of typhoid fever were carried over from month to month in this hospital. For instance, on the face of these reports it would appear that with a mean strength of 2,113 in November there was a much larger proportion of typhoid fever than during any other month, but, as already stated, most of these cases are carried over from preceding months.

GENERAL REMARKS CONCERNING TYPHOID FEVER IN THE SECOND DIVISION OF THE FIRST ARMY CORPS.

It seems to us more than probable that the water supply for this division during May, June, and July at Chickamauga became infected with the specific poison of typhoid fever. We think that this was most probably true of the Jay's mill well, from which the first and second brigades obtained their water supply in part, and of the Brotherton road well, from which the third brigade obtained its water supply for some time after its arrival. The location of both of these wells with reference to the camps which they supplied, together with the fact that these camps were infected, renders it much more than probable that the water of these wells became infected with typhoid fever. We are quite positive in our belief that water infection was one of the means by which typhoid fever was spread through this division while at Chickamauga. It is unfortunate that proper bacteriological studies of these waters could not have been made at the time. As has already been stated, we see no reason for believing that these wells were infected when the troops arrived. In fact, we have already given strong reasons for believing that these wells were not infected at that time. Employees about the park had long been accustomed to drink these waters and typhoid fever had not followed. The water from these wells did not introduce typhoid fever among the troops. The troops brought the disease, infected the water, and then drank it. We do not make these statements as demonstrated facts, but as the opinions which we have reached as a result of our study.

However, water was not the only means by which typhoid fever was spread among the troops of this division at Chickamauga. Like all other organizations in the park at that time, the camps of the regiments of this division became terribly polluted. Sinks could not be properly constructed. Their contents were not kept covered or even kept within bounds, but overflowed

and polluted the soil about them. Flies swarmed alternately about the sinks and the mess tents. Men carried infected filth on their persons and in their clothing. Tents, blankets, and equipage in general became infected, and when this division moved to Knoxville it carried with it innumerable cultures of the typhoid bacillus.

At Knoxville the water supply was not contaminated, but the infection brought in the bodies of the men and in their clothing and equipage was disseminated by flies, and the epidemic continued until the coming of cold weather destroyed these pests, which had inflicted greater loss upon the American soldiers than the arms of Spain had.

The fact that the epidemic of typhoid fever at Knoxville disappeared with the approach of cool weather—at a time when typhoid fever is generally found to be most rife in civil practice—is to us a strong confirmation of our belief that flies had much to do with the dissemination of this infection.

Summary of deaths in the Second Division of the First Army Corps.

Brigade and regiment.	Total deaths.	Deaths due to typhoid fever.
<i>First Brigade.</i>		
Thirty-first Michigan	27	16
One hundred and sixtieth Indiana	11	8
First Georgia	10	9
Total	48	33
<i>Second Brigade.</i>		
One hundred and fifty-eighth Indiana	12	10
Sixth Ohio	21	19
First West Virginia	15	12
Total	48	41
<i>Third Brigade.</i>		
First Pennsylvania	14	12
Fourteenth Minnesota	13	12
Second Ohio	14	13
Total	41	37
<hr/>		
Total deaths	137	
Deaths due to typhoid fever	111	
Percentage of deaths from typhoid to total deaths, 81.		

CHAPTER III.

TYPHOID FEVER IN THE THIRD DIVISION OF THE FIRST ARMY CORPS.

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FIFTH PENNSYLVANIA VOLUNTEER INFANTRY.

First Brigade, Third Division, First Army Corps.

This regiment, consisting of eight companies, assembled at Mount Gretna, Pa., and was mustered into the service of the United States May 11. On May 17 it departed for Chickamauga Park, Ga., arriving May 20.

The May report is signed by Maj. Andrew S. Stayer, who makes no comments.

CONDENSED SICK REPORT FROM MAY 11 TO MAY 31, INCLUSIVE.

Mean strength.....	639
Admissions—From command.....	15
Completed cases.....	13
Returned to duty.....	13
Remained on sick report:	
Hospital	2
Quarters	0

The June report is signed by Lieut. Samuel P. Glover, acting regimental surgeon, who makes the following statement:

Typhoid fever and acute diarrhea have been the prevailing diseases. For the former extra policing of the sinks, closets, and care of the mess tents, with boiling of the water as far as possible, have been attended to. Chloride of lime is used as freely as it is supplied. Watching the sutler's tents helps to check the diarrhea. A regimental hospital was maintained until June 15. From that time on patients were sent to the division hospital.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	647
Admissions:	
Remaining from last month.....	2
From command	147
Total to be accounted for.....	149

Returned to duty.....	130
Died.....	1
Total	131
Remaining on sick report:	
Hospital	8
Quarters	10
Completed cases.....	131

The July report is signed by Lieutenant Glover, who states:

The camp has been on low ground since May 20. Requests were sent in for a change of location during June and July. With the three weeks of heavy rains nearly every day in July, the ground was damp and muddy and at times during heavy showers received the washings from the camp above. Diarrhea and typhoid fever were the prevailing diseases, with many of a malarial nature. The water was ordered boiled and filtered; sinks were dug frequently and carefully policed, but filled up rapidly with water from the damp soil. Chloride of lime and ordinary unslaked lime have been used as freely as supplied.

CONDENSED SICK REPORT FOR JULY.

Mean strength	873
Admissions:	
Remaining from last month	18
From command	528
Total to be accounted for.....	546
Returned to duty.....	413
Died.....	2
Transferred to other hospitals	5
Total	420
Remaining on sick report:	
Hospital	13
Quarters	113

The August report is signed by Major Stayer, with the following comments:

The command was in Camp George H. Thomas, Chickamauga Park, near Alexandria Bridge, from August 1 to 12, when it removed to the new camp 2 miles west on a higher piece of ground.

The prevailing diseases in this regiment for this month have been typhoid fever, intermittent and remittent fevers, and diarrhea. The cause of these diseases was largely due to the unhealthy location of the camp near Alexandria Bridge. In the first place, this camp was in a deep shade; in the second place, it was very low and flat, and had no natural drainage, so that the slightest moisture kept the streets continuously muddy. The latrines and kitchen sinks had to be dug in a clay, which is absolutely devoid of porosity. This camp received the surface water of the Twelfth Minnesota Volunteer Infantry, which was located south and above our camp. The diarrheas have been mostly caused by the men purchasing pastries, etc., beyond the camp limits of the regiment. I made verbal objection to the occupation of the first camp site for this regiment upon my arrival, May 20, 1898. Moreover, every few days I recommended the removal of the camp, and while acting as surgeon of the regiment I made recommendation for its removal, July 11 and 12. To prevent the sale of pastries, the guards were instructed to arrest all peddlers. I have also recommended the change of location every ten days. Lime has been used as a disinfectant from August 4.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,291
Admissions:	
Remaining from last month.....	116
From command	494
Total	610
Returned to duty.....	400
Died	4
Deserted.....	1
Transferred to other hospitals.....	107
Otherwise disposed of	67
Total	579
Remaining on sick report:	
Hospital	0
Quarters	31

It should have been stated that during July and the first part of August this regiment was filled out by the addition of four new companies. This regiment left Chickamauga Park, Ga., August 23, 1898, and proceeded to Lexington, Ky.

The September report is signed by Major Stayer, with the following statement:

This command left Camp Hamilton, Ky., September 17, 1898, as per telegraphic order from War Department. The following companies composing it moved to their several rendezvous, as follows:

Company A, Huntingdon, Pa.; Company B, Bellefonte, Pa.; Company C, Hollidaysburg, Pa.; Company D, Blairsville, Pa.; Company E, Clearfield, Pa.; Company F, Indiana, Pa.; Company G, Lewistown, Pa.; Company H, Johnstown, Pa.; Company I, Somerset, Pa.; Company K, Wellsboro, Pa.; Company L, Clearfield, Pa.; Company M, Gettysburg, Pa.

Each company was granted a thirty-days' furlough, with a view of mustering out. Most of the companies arrived at the above-mentioned places September 18, 1898.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,294
Admissions:	
Remaining from last month.....	30
From command	169
Total to be accounted for	199

Returned to duty.....	134
Transferred to other hospitals.....	24
Otherwise disposed of	41
Completed cases.....	199

The October report is signed by Major Stayer, with the following remarks:

The prevailing diseases are typhoid and remittent fevers, caused in many cases by the carelessness of the men themselves while in camp, as well as when at home on furlough. The furlough of the regiment having expired October 18, the regiment was on duty from said date until November 1, in order that it might take part in the Peace Jubilee in Philadelphia, October 26, 27, and 28. The regiment moved to Philadelphia October 25, and after the ceremonies the various companies returned to their armories October 29, 1898. The casualties on the Philadelphia trip was one man killed while crossing the railroad track at Tyrone, Pa.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,283
Admissions:	
Remaining from last month, with all uncompleted cases of the months past, from all sources	218
From command	86
Total to be accounted for	304
Returned to duty.....	259
Died	7
Transferred to other hospitals.....	8
Total	274
Remaining on sick report:	
Hospital	0
At home.....	30
Completed cases.....	305

The November report is signed by Major Stayer, who states:

There is nothing of special interest in the medical department of this regiment. The companies composing the regiment were located at the places already mentioned.

CONDENSED SICK REPORT FOR SEVEN DAYS IN NOVEMBER.

Mean strength	1,376
Admissions:	
Remaining from last month.....	38
From command	3
Total to be accounted for	41
Died	1
Completed cases.....	41

For want of space we will not add a list of the probable cases of typhoid fever in this regiment, but will submit only a summary.

There is no doubt that this regiment reached Chickamauga Park, Ga., infected with typhoid fever. The first reported case is that of a private from Company D; the initial date of this case was May 19; the disease was diagnosed typhoid fever; the patient then was sent to Fort Thomas July 6, and was discharged from this hospital October 18.

During the month of June there were 11 cases. Of these, 1 had its initial date June 10, another followed on June 11; there were 2 cases June 16; 1, June 20; 1, June 24; 1, June 26; 2, June 27, and 2 June 30.

The number of cases for each month may be given as follows:

May	1	October	10
June	11	November	1
July	72		
August	142	Total	338
September	101		

SUMMARY.

Assembled at Mount Gretna, Pa., April 27, 1898.	
Mustered into United States service May 11, 1898.	
Arrived at Chickamauga Park May 20, 1898.	
Strength on arrival, 639.	
Date of first case of probable typhoid fever, May 19, 1898.	
Date of first case of recognized typhoid fever, May 19, 1898.	
Left Chickamauga Park August 23, 1898.	
Strength on departure, 1,291.	
Number of cases of probable typhoid fever developed at Chickamauga	182
Arrived at Lexington, Ky., August 23, 1898.	
Left Lexington, Ky., September 17, 1898.	
Number of cases of probable typhoid fever developed at Lexington, Ky.	103
The companies of this regiment dispersed to their respective armories September 17, 1898.	
Number of cases of probable typhoid fever developed in the companies after dispersion	53
Total number of cases of probable typhoid fever developed in the Fifth Pennsylvania Volunteer Infantry ..	338
These 338 cases were diagnosed as follows:	
Typhoid fever	152
Malaria	141
Diarrhea	39
Indigestion	6
Total	338

Several questions of interest concerning this regiment might be asked. One of these is as follows: Did the four companies that first reached Chickamauga in July suffer as greatly from typhoid fever as did the other companies? The distribution of probable cases of typhoid fever among the companies in this regiment, together with the date of the first case in each company, may be seen in the following table:

Company.	Date of first case.	Number of cases.
A	July 7	28
B	June 24	26
C	June 16	30
D	May 19	28
E	June 27	34
F	June 10	33
G	June 20	33
H	June 11	22
I	July 25	30
K	July 22	32
L	July 26	29
M	July 21	10

It will be seen from the above figures that all the original companies were infected with typhoid fever before the arrival of the recruited companies. The average number of cases in the eight original companies for the whole time is 29.25, while that in the four recruited companies is 25.25, but the smaller average in the recruited companies is due to the very small num-

ber in Company M, consequently it would not be wise to place great stress upon the small difference in the averages. We have not been able to ascertain the date of the arrival of the recruited companies, nor do we know that all of them arrived at the same time. The probabilities are that they did not. If all of the recruited companies had arrived early in July the mean strength for that month would have been greater than that given in the report for that month. From the dates given it is shown that Company L was the last to become infected with typhoid fever, and notwithstanding this fact it averaged with the companies that had been in the service since May. We did not expect that the answer to the question asked concerning the distribution in the companies would be other than it turns out to be. The new companies came into a polluted camp and probably were quite as susceptible to the infection as those who had been there longer. Before July 22 there had already been in the eight original companies 30 cases of probable typhoid fever. After July 22, the initial date of the first case among the recruits, the average among the original companies was 25.5, practically the same as the average among the recruited companies.

Another question of interest concerns the relative number of cases of typhoid fever in this regiment and in the Twelfth Minnesota. By referring back to the monthly sick reports it will be seen that Major Stayer, of the Fifth Pennsylvania, complained earnestly and properly of the location of the first camp of this regiment. Among other things he states that the camp of the Fifth Pennsylvania received the drainage from that of the Twelfth Minnesota. We can state quite positively that the Pennsylvania regiment did not receive its first infection from the Minnesota regiment, because the former reached Chickamauga with a case of typhoid fever already developed. However, the Twelfth Minnesota certainly became widely infected, and it is to be regretted that the camp of the Pennsylvania regiment was not moved earlier than it was.

The curve of typhoid fever in this regiment is peculiar on account of the break of just one week in the middle of July (July 13 to 20) during which time not a case was reported, while during both the preceding and subsequent weeks there were one or more cases reported each day. This would indeed be of great interest did we know that the data given are correct, but we can not know this. The break is more likely due to an interruption in bookkeeping than to an actual interruption in cases of fever. It is probable that one or more of the 8 cases reported July 22 had their true initial date earlier.

It certainly will be of interest to inquire into the occurrence of typhoid fever among the companies of this regiment after their dispersion. From such an inquiry we may be able to get information concerning the extent to which the infection prevailed among the men after they went to their homes. This regiment,

as has been stated, divided up into companies, and each company started for its home town September 17, 1898. During the following week, as the records show, the number of new cases reported from the scattered companies was nearly twice as great as it had been for the regiment as a whole during the last week of its stay at Lexington. With the beginning of the second week after dispersion typhoid fever suddenly and greatly decreased, and from this time on for more than a month after the dispersion occasional cases developed. Can it be possible that the men in this regiment who developed typhoid fever after the middle of October became infected before they left Lexington? In other words, may the period of incubation in typhoid fever be prolonged to from four to six weeks? Quite obviously this question can not be answered from the data at our command with scientific certainty, but there are reasons for believing that it may be answered affirmatively. These men left an infected camp September 17, and more than four weeks later some of them developed typhoid fever. The infection which developed these late typhoids may have been brought from Lexington or it may have been found at the homes of the men or on the way to their homes. The six cases on and after October 15 were distributed through five companies. Let us state the question fairly, as follows: Six men exposed to typhoid infection at Lexington, Ky., go to five different places in Pennsylvania, at none of which, presumably, was there an epidemic of typhoid fever, and during the fifth week after leaving the infected place these six men developed typhoid fever. Does it not seem probable that the infection that developed in these men was obtained at the place where all were exposed?

We believe that this is the most satisfactory explanation. We have collected several similar cases bearing on this point. A hospital steward, who had been caring for typhoid-fever patients at Ponce, P. R., left that place and went to his home, a small town in the interior of Pennsylvania, where there had been no cases of typhoid fever for at least a year before and where no one but he developed the disease during the fall of 1898. During the fifth week after leaving Ponce he became ill with typhoid fever. Is it not more than probable that in this case the infection was brought from the typhoid-fever hospital at Ponce? Other like cases have come to our knowledge. English army officers report similar cases also. For instance, take the histories of men exposed to typhoid fever in upper Egypt. These men have returned to England and have developed typhoid fever six weeks after leaving the infected locality. However, in our opinion, this does not prove that the period of incubation of typhoid fever, properly speaking, can be prolonged as greatly as indicated in these statements. These men may have left an infected locality bearing the typhoid infection with them on their persons, under their finger nails, in their

hair or on their clothing or in their baggage, and some time later this infection may have found its way into the alimentary canal. We have gone into this inquiry for the purpose of recommending the disinfection of the person and the personal effects of those exposed to typhoid infection rather than for the purpose of attempting to determine how long the period of incubation for this disease may be extended. At any rate it is safe to say that without such disinfection one who has lived in a camp in which typhoid fever has prevailed is liable to develop this disease any time within six weeks after leaving such a camp.

The relative number of cases developed in the Fifth Pennsylvania and Twelfth Minnesota regiments, closely associated, may be of interest. These regiments arrived at Chickamauga Park on the same day; they were brigaded together; they left Chickamauga Park on the same day; both went to Lexington, Ky., and remained at that place practically the same time. On leaving Lexington the Pennsylvania regiment broke up into companies and went to twelve small towns in Pennsylvania. The Minnesota regiment went in a body to New Ulm and remained there about one month. In making this comparison we find that the mean strength in these two regiments from May to October was about the same. While the Pennsylvania regiment went to Chickamauga with only eight companies, and thus reduced its average strength for the six months to 1,004, the Minnesota regiment was so reduced by illness that its mean strength for the six months was only 1,071. We must therefore conclude that the Minnesota regiment suffered more severely, measured by the number of cases of probable typhoid fever, than did the Pennsylvania regiment. This difference would probably be more marked had we not been compelled to omit altogether from our list of probable cases the 101 cases left incomplete at the close of the July report of the Minnesota regiment. Pushing this comparison further, it appears that the Minnesota regiment suffered more severely at Chickamauga and the Pennsylvania regiment more severely after leaving Chickamauga. But it must be remembered that the mean strength of the Minnesota regiment while at Chickamauga was much greater than that of the Pennsylvania regiment, and that in this particular the position of the regiments was reversed later. So far as a comparison of these regiments gives us information, there was apparently no advantage to the Pennsylvania regiment in breaking up into companies; but stress must not be placed on this point, because nearly one-third of the Minnesota regiment had been disabled by sickness before September 1, 1898, and it is probable that most of the susceptible persons in this regiment had typhoid fever.

Both the Fifth Pennsylvania and the Twelfth Minnesota had two camp sites at Chickamauga. The first one, occupied by the Fifth Pennsylvania, became horribly polluted. In his report to the Surgeon-General

on the sanitary condition of Camp Thomas, August 7, 1898, Lieutenant-Colonel Woodhull states:

In the Fifth Pennsylvania the camp site was lower than the sinks, and during recent rains the sinks overflowed and flooded the camp. The sick report of this regiment was 31 per cent, including 25 cases of recognized typhoid fever and 15 supposed to be of that disease, with the sick rate increasing.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Blakely, Joseph A....	Pvt., F.	Aug. 25	Chickamauga, Ga....	Typhoid.
Bottom, Charles W....	Pvt., G.	Sept. 13	Camp Thomas, Ga....	Do.
Dibble, Wm. G.	Pvt., K.	Aug. 31	Chickamauga, Ga....	Do.
Enos, Wilson G.	Pvt., I.	Sept. 18	Pittsburg, Pa.	Do.
Garis, Charles	Col. Sgt., B	Aug. 28	Chickamauga, Ga....	Do.
Hazlett, Ernest M....	Pvt., K.	Aug. 30	Division hospital, Chickamauga, Ga.	Do.
Homan, George W....	Pvt., H.	June 27	Camp Thomas, Ga....	Do.
Mahaffey, James T....	Pvt., E.	Sept. 10	Lexington, Ky. (St. Joseph's Hospital).	Do.
Mays, Frank E.	Artl., E.	Nov. 8	Oscola Mills, Pa.	Do.
Robinson, Joseph C....	Pvt., C.	Aug. 12	Chickamauga, Ga....	Do.
Stonebreaker, Wm. F.	Pvt., E.	Sept. 29	Indiana, Pa.	Do.
Schlitter, Henry L....	Pvt., L.	Sept. 3	Pittsburg, Pa.	Do.
Steffy, Wm. M.	Sgt., M.	Aug. 18	Camp Thomas, Ga....	Do.
Taylor, Frank H.	Bund, B.	July 7	Chickamauga, Ga....	Do.
Thomas, John	Pvt., B.	Sept. 18	Camp Hamilton, Ky..	Do.
Woomer, Francis M....	Pvt., G.	July 22	Place not given	Do.

♂Major Stayer reports that this man died of cerebro-spinal meningitis.

It will be seen that all of these 16 deaths were due to typhoid fever. Sixteen among 328 cases gives a death rate of 4.73 per cent.

Percentage of deaths among 152 recognized cases of typhoid fever equals 10.52.

COMMUNICATIONS FROM THE SURGEONS OF THE FIFTH PENNSYLVANIA.

Medical officers.

Andrew S. Stayer, major and surgeon, Altoona, Pa.

Robert G. H. Hayes, lieutenant and assistant surgeon, Bellefonte, Pa.

Samuel P. Glover, lieutenant and assistant surgeon, Altoona, Pa.

Lieutenant Hayes states with reference to the camp at Chickamauga:

Our camp was on low ground and received the surface washings from the near-by camps and adjacent country. It was impossible to keep our sinks in good condition. We obtained our drinking water from a well and from Chickamauga Creek.

Major Stayer has sent us a communication, from which we make the following extracts:

On the second day after our arrival at Chickamauga we recognized our first case of typhoid fever in the person of William Patrick, who arrived at Mount Gretna with the first batch of recruits from his home near Blairsville, Pa., May 1, 1898, and no doubt brought the infection from his home. This patient was kept completely isolated from the command in the regimental hospital outside of the guard line. All his excretions were promptly buried and the vessels used disinfected with a solution of bichloride of mercury. On June 15 he was transferred to the Third Division hospital, and later he was sent to Fort Thomas, Ky.

The location of our first camp at Chickamauga was bad—the worst of any in Chickamauga Park. To our right on the hillside, at least 50 feet above the level of our camp, was the Twelfth Minnesota Volunteer Infantry, the surface drainage from which passed through our camp. To our rear and at least 15 feet above the level of the camp were our latrines. The natural drainage from this point also passed through our camp. On our right was a stinking pigsty, in front of what was then general headquarters. On our front flowed a slow, sluggish stream carrying the surface water from at least twenty regiments; the stench that greeted our nostrils from

this stream was almost unbearable. Great care was taken to keep this place as healthy as possible. The latrines were filled in three times a day with earth by the officer of the day. I might add that although the quarters of the officers and men were properly ditched, yet when the hard rains came water flowed into the tents to the depth of 5 or 6 inches. This regiment was obliged to maintain a regimental hospital until sufficient tentage could be secured to enlarge the division hospital, which was not accomplished until August 22, when some 62 patients were transferred to division hospital.

Our second camp at Chickamauga, to which this regiment moved August 12, was on a knoll 2 miles away from the old camp, and was an ideal location so far as surface drainage was concerned, but the ground was clayey, without porosity, and the limestone rock lay within 2 feet of the surface. Notwithstanding these difficulties, our latrines were dug from 6 to 8 feet deep by blasting out rock. Sheds were built over these excavations, forming first-class wooden closets, all tightly closed, effectually shutting out the light, thus excluding the flies, which pest seemed to be a considerable source of infection. Lime was used extensively as a disinfectant, a barrel being placed in each closet and guards located near them to enforce care of the sinks. A larger number of typhoid cases occurred in the new camp than in the old one, but the infection undoubtedly came from the old camp.

I think that the number of recognized cases of typhoid fever has been placed too high. Before sending the register of sick and wounded to Washington I went over the diagnoses, and my estimate was only 90 cases of recognized typhoid fever and 140 cases of malaria.

The camp at Lexington, Ky., was, sanitarily, considered excellent. It is true that quite a number sickened in this camp, but the majority of the cases developed here were of the malarial character, having distinctive exacerbations with characteristic symptoms of blue lips and finger nails during the chills. When the regiment left Camp Hamilton for home on furlough, all sick in the hospital were taken with us and left at Johnstown, Altoona, and in other hospitals near the homes of the men, except John Thomas, who died the same day we left, and Milton Dunn, who preferred to remain in the division hospital.

I am satisfied that the new recruits were more susceptible to typhoid fever than the men who had been with us from the first. This regiment first started out with 55 men to a company; then at Mount Gretna the companies were recruited to 75, finally at Chickamauga, in the latter part of June, all companies were recruited to 100 men. My observations lead me to assert that a larger number of the new men contracted the disease. The material selected in recruiting was not as good as that originally in the regiment. The fact that Company M suffered so little in comparison with the other companies may have been due to the fact that the captain of this company was an old officer who had had experience in the civil war and who cared for his men admirably.

The extensive infection of the Twelfth Minnesota Volunteer Infantry might have been due to the fact that this regiment supported a canteen, while the Fifth Pennsylvania had none.

The men who developed typhoid fever after reaching their homes may have acquired the disease at their homes, inasmuch as typhoid fever was largely prevalent throughout this portion of Pennsylvania in the fall of 1898.

TWELFTH MINNESOTA VOLUNTEER INFANTRY.

First Brigade, Third Division, First Army Corps.

In the May report Captain Caine makes the following statement:

The Twelfth Regiment Minnesota Volunteer Infantry was mustered into United States service May 6 and 7 at Camp Ramsey, St. Paul, Minn. It remained at Camp Ramsey eighteen days. During the greater part of this time it was very windy and the nights

were cold. Many soldiers suffered from catarrhal inflammation of the nose, throat, and bronchial mucous membrane, and several cases of ophthalmia developed. There were also cases of measles, pneumonia, and meningitis. En route from Camp Ramsey to Camp George H. Thomas, from May 16 to 19, inclusive, 3 cases of measles developed. These were quarantined at Rossville, Tenn.

Here at Chickamauga the regiment is fairly located. The topography of camp ground, however, is rough and will render it difficult to establish perfect drainage. The unsuitable rations and inexperienced cookery have been the cause of gastro-intestinal disturbances. The camp is thoroughly policed and all hygienic measures have been adopted.

CONDENSED SICK REPORT FROM MAY 6 TO MAY 31, INCLUSIVE.

Mean strength	1,032
Diarrhea.....	35
Indigestion	47
Dysentery	3
Other diseases.....	101
Total	186

In the June report Assistant Surgeon Rowe makes the following statement:

Intestinal disorders, diarrhea, and dysentery have been the prevailing diseases, due principally to indiscretions in diet. Typhoid and malarial fevers have also prevailed. The use of boiled water for drinking purposes and strict attention to hygienic conditions have been instituted for their control. A few cases of measles and mumps have developed, but strict quarantine measures being adopted there have been no others affected.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,032
Indigestion	111
Diarrhea.....	80
Dysentery	1
Undetermined fever	8
Other diseases.....	126
Total	326

The discrepancy between the statement of Assistant Surgeon Rowe and the sick record must be evident. The surgeon states that typhoid and malarial fevers have prevailed during the month, and yet neither typhoid fever nor malaria appear on the sick report.

There is no comment made on the July report.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,308
Indigestion	331
Diarrhea.....	41
Undetermined fever	41
Malarial fever.....	18
Intermittent malaria.....	2
Remittent malaria.....	3
Dysentery	1
Typhoid fever.....	11
Other diseases.....	138
Total	586

This report closes with 101 incomplete cases. These incomplete cases are not carried on to the report for August. Consequently, there is nowhere in the regi-

mental records, so far as we can find, any evidence of their disposition. How many, if any, of these had typhoid fever we can not know.

The August report is also without comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,232
Indigestion	118
Diarrhea.....	16
Malaria.....	326
Undetermined fever	3
Other diseases.....	317
Total	780

This regiment left Chickamauga Park August 22 and reached Lexington, Ky., August 23. Captain Caine makes the following statement:

In consequence of malarial infection resulting from encampment of three months in Chickamauga Park many officers and men, immediately after arrival of the regiment at Lexington, became ill with typhoid, malarial fever, and dysentery, which diseases have continued from the date of the arrival of the regiment until the date of making this report. The sanitary conditions of Camp Hamilton and the climatic conditions and location of the same are excellent.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	912
Indigestion	33
Diarrhea.....	73
Malaria.....	75
Typhoid fever.....	2
Undetermined fever	12
Other diseases.....	119
Total	314

This regiment left Camp Hamilton, Ky., September 15, and reached New Ulm, Minn., September 17, and immediately went into camp at the Fair Grounds. The sick brought with the regiment were placed in St. Alexander Hospital, New Ulm, for treatment. Those taken sick after the arrival of the regiment at New Ulm were treated in the regimental hospital; however, the more serious cases of these were also sent to St. Alexander Hospital. The surgeon states that the sickness existing during the month of September was due to malarial infection introduced into the regiment at Camp Thomas. The location of the camp at New Ulm was said to be excellent. The water was also said to be excellent, but no particulars are given.

On account of the incompleteness of the records of this regiment it is quite impossible to be certain concerning the number of typhoid cases. However, the following list gives the best information that we can obtain upon this subject:

No. 1. Company D: Indigestion, May 20 to 31.

No. 2. Company D: Indigestion, May 20 to 31.

These two cases diagnosed as "indigestion" were so much more prolonged than any other of the cases of

the same diagnosis during that month that it is possible they may have been typhoid fever. On this point, however, we do not wish to express any positive opinion.

No. 3. Company D: Undetermined fever, June 1; furloughed from division hospital July 12. In hospital this case was diagnosed typhoid fever.

No. 4. Company D: Typhoid fever, June 7; furloughed September 8. On the regimental record it seems that this man was returned to duty July 5, while the hospital record shows that he was sick with typhoid fever at that time and was not furloughed until September 8.

No. 5. Company I: Indigestion, June 8; still sick in hospital June 30.

No. 6. Company C: Diarrhea, June 17; furloughed from division hospital July 27. In hospital this case was diagnosed typhoid fever.

No. 7. Company C: Diarrhea, June 19; still sick in hospital July 31.

No. 8. Company C: Indigestion, June 19; still sick July 31.

No. 9. Company M: Typhoid fever, June 19; still sick September 15.

No. 10. Company E: Diarrhea, June 21; discharged from division hospital July 19. In hospital this case was diagnosed typhoid fever.

No. 11. Company M: Typhoid fever, June 21; furloughed from Leiter Hospital July 27.

No. 12. Company I: Undetermined fever, June 21; furloughed from Fort Thomas September 22. In hospital this case was diagnosed typhoid fever.

No. 13. Company I: Remittent malaria, June 22 to July 21.

No. 14. Company E: Indigestion, June 22 to July 29.

No. 15. Company E: Intermittent malaria, June 22 to July 9.

No. 16. Company G: Typhoid fever, June 23; furloughed July 15.

No. 17. Company E: Typhoid fever June 23 to July 26.

No. 18. Company K: Indigestion, June 24 to July 15.

No. 19. Company E: Remittent malaria, June 24 to July 26.

No. 20. Band: Malaria, June 24; furloughed July 30.

No. 21. Company F: Indigestion, June 25; furloughed July 15.

No. 22. Company H: Indigestion, June 26; furloughed from Leiter Hospital August 12. In hospital this case was diagnosed typhoid fever.

No. 23. Company E: Indigestion, June 26 to July 31.

No. 24. Company E: Typhoid fever, June 28 to July 29.

No. 25. Company E: Typhoid fever, June 28 to July 24.

No. 26. Company K: Indigestion, June 29; still sick July 31.

No. 27. Company C: Indigestion, June 29; furloughed from Fort Thomas October 17. In hospital this case was diagnosed typhoid fever.

No. 28. Company E: Undetermined fever, June 29; furloughed from Fort Thomas September 5. In hospital this case was diagnosed typhoid fever.

No. 29. Company E: Indigestion, June 29; furloughed from Fort Thomas September 11. In hospital this case was diagnosed typhoid fever.

No. 30. Company not given: Colitis, June 29 to July 25.

No. 31. Company A: Typhoid fever, June 30; still sick July 31.

No. 32. Company C: Diarrhea, June 30; furloughed from Leiter Hospital August 12. In hospital this case was diagnosed typhoid fever.

No. 33. Company E: Indigestion, July 1; furloughed from Fort Thomas September 15. In hospital this case was diagnosed typhoid fever.

No. 34. Company E: Indigestion, July 2; furloughed from Fort Thomas September 5. In hospital this case was diagnosed typhoid fever.

No. 35. Company E: Indigestion, July 2; furloughed from Fort

Thomas in September. In hospital this case was diagnosed typhoid fever.

No. 36. Company D: Undetermined fever, July 2; still sick August 31.

No. 37. Company E: Undetermined fever, July 3; furloughed from Fort Thomas September 16. In hospital this case was diagnosed typhoid fever.

No. 38. Company I: Undetermined fever, July 3; still sick August 31.

No. 39. Company E: Indigestion, July 4; still sick in division hospital July 31.

No. 40. Company E: Indigestion, July 4; sent to Fort Thomas July 25. Here the disease was diagnosed typhoid fever.

No. 41. Staff: Undetermined fever, July 4; sick in St. Vincent's hospital at Chattanooga July 31.

No. 42. Company M: Undetermined fever, July 5; died at Fort Thomas July 11.

No. 43. Company E: Indigestion, July 5; still sick in division hospital July 31.

No. 44. Company K: Diarrhea, July 5 to 22.

No. 45. Company L: Indigestion, July 5; furloughed July 22.

No. 46. Company E: Indigestion, July 5; still sick in division hospital July 31.

No. 47. Company A: Undetermined fever, July 6; still sick in division hospital July 31.

No. 48. Company A: Indigestion July 6; still sick August 31.

No. 49. Company I: Sent to Fort Thomas without diagnosis July 6. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 15.

No. 50. Company M: Indigestion, July 6; still sick in division hospital July 31.

No. 51. Band: Indigestion, July 6; still sick in division hospital July 31.

No. 52. Company A: Sent to Fort Thomas without diagnosis July 6. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 22.

No. 53. Company C: Sent to Fort Thomas without diagnosis July 6. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 5.

No. 54. Company G: Colitis, July 7; still sick in Leiter Hospital July 31. In hospital this case was diagnosed typhoid fever.

No. 55. Company C: Indigestion, July 7; furloughed from Leiter Hospital August 10. In hospital this case was diagnosed typhoid fever.

No. 56. Company G: Indigestion, July 7; still sick August 31.

No. 57. Company I: Indigestion, July 7; still sick July 31.

No. 58. Company H: Undetermined fever, July 8; furloughed from Leiter Hospital September 8.

No. 59. Company E: Undetermined fever, July 8; still sick at Fort Thomas July 31.

No. 60. Company K: Indigestion, July 8; still sick in division hospital July 31.

No. 61. Company G: Indigestion, July 8; still sick in division hospital July 31.

No. 62. Company E: Undetermined fever, July 8; still sick at Fort Thomas July 31. In hospital this case was diagnosed typhoid fever.

No. 63. Company E: Undetermined fever, July 8; still sick in division hospital July 31.

No. 64. Company G: Indigestion, July 9; still sick in division hospital July 31.

No. 65. Company I: Indigestion, July 9; still sick July 31.

No. 66. Company G: Sent to division hospital without diagnosis July 10. Here the disease was diagnosed typhoid fever and the patient was furloughed September 8.

No. 67. Company L: Indigestion, July 10; still sick in division hospital July 31.

No. 68. Company E: Undetermined fever, July 10; still sick at

Fort Thomas July 31. In hospital this case was diagnosed typhoid fever.

No. 69. Company E: Undetermined fever, July 10; still sick at Fort Thomas July 31. In hospital this case was diagnosed typhoid fever.

No. 70. Company M: Indigestion, July 10; still sick in division hospital July 31.

No. 71. Company M: Indigestion, July 11; still sick in division hospital July 31.

No. 72. Company H: Indigestion, July 11; furloughed from division hospital September 25. In hospital this case was diagnosed typhoid fever.

No. 73. Company K: Indigestion, July 11; still sick August 31.

No. 74. Company C: Indigestion, July 11 to 31.

No. 75. Company M: Indigestion, July 12; still sick July 31.

No. 76. Company A: Undetermined fever, July 13; still sick in quarters July 31.

No. 77. Company A: Undetermined fever, July 13; still sick in division hospital July 31.

No. 78. Company A: Indigestion, July 13; still sick in division hospital July 31.

No. 79. Band: Indigestion, July 13; still sick in Leiter Hospital July 31. In hospital this case was diagnosed typhoid fever.

No. 80. Company M: Indigestion, July 14; furloughed from Leiter Hospital September 13. In hospital this case was diagnosed typhoid fever.

No. 81. Company L: Indigestion, July 14 to 28.

No. 82. Company M: Indigestion, July 14 to 30.

No. 83. Company D: Undetermined fever, July 14; furloughed from Leiter Hospital August 16. In hospital this case was diagnosed typhoid fever.

No. 84. Company B: Indigestion, July 14; still sick in quarters July 31.

No. 85. Company E: Indigestion, July 14; still sick in division hospital July 31.

No. 86. Company H: Undetermined fever, July 14; still sick in division hospital August 31.

No. 87. Company G: Undetermined fever, July 14; furloughed from Leiter Hospital August 18. In hospital this case was diagnosed typhoid fever.

No. 88. Band: Undetermined fever, July 14; still sick in division hospital July 31.

No. 89. Company I: Indigestion, July 15; still sick at Fort Thomas July 31. In hospital this case was diagnosed typhoid fever.

No. 90. Company I: Undetermined fever, July 15; still sick at Fort Thomas July 31. In hospital this case was diagnosed typhoid fever.

No. 91. Company H: Undetermined fever, July 15; furloughed from Leiter Hospital August 16. In hospital this case was diagnosed typhoid fever.

No. 92. Company F: Diarrhea, July 15; still sick in division hospital July 31.

No. 93. Company C: Undetermined fever, July 15; still sick at Fort Thomas July 30. In hospital this case was diagnosed typhoid fever.

No. 94. Company M: Undetermined fever, July 16; still sick in quarters August 31.

No. 95. Company B: Indigestion, July 16; still sick in Leiter Hospital July 31. In hospital this case was diagnosed typhoid fever.

No. 96. Company D: Undetermined fever, July 16; furloughed from Leiter Hospital September 6. In hospital this case was diagnosed typhoid fever.

No. 97. Company A: Undetermined fever, July 16; still sick August 31.

No. 98. Company E: Malaria, July 16; still sick August 31.

No. 99. Company E: Undetermined fever, July 16; furloughed from Leiter Hospital August 23. In hospital this case was diagnosed typhoid fever.

No. 100. Company I: Undetermined fever, July 17; still sick in Leiter Hospital July 31. In hospital this case was diagnosed typhoid fever.

No. 101. Company C: Malaria, July 17; still sick in division hospital July 31.

No. 102. Company I: Undetermined fever, July 17; still sick at Fort Thomas July 31. In hospital this case was diagnosed typhoid fever.

No. 103. Company M: Undetermined fever, July 17; still sick in division hospital July 31.

No. 104. Company M: Undetermined fever, July 17; still sick in Leiter Hospital July 31. In hospital this case was diagnosed typhoid fever.

No. 105. Company A: Undetermined fever, July 17; furloughed from Leiter Hospital September 6. In hospital this case was diagnosed typhoid fever.

No. 106. Company M: Undetermined fever, July 17; died in Leiter Hospital August 13. In hospital this case was diagnosed typhoid fever.

No. 107. Company A: Undetermined fever, July 17; still sick in Leiter Hospital July 31. In hospital this case was diagnosed typhoid fever.

No. 108. Company L: Malaria, July 17; still sick August 31.

No. 109. Company F: Undetermined fever, July 18; still sick August 31.

No. 110. Company G: Undetermined fever, July 18; furloughed from division hospital August 27.

No. 111. Company K: Undetermined fever, July 18; still sick August 31.

No. 112. Company G: Indigestion, July 18; still sick in quarters July 31.

No. 113. Company C: Indigestion, July 18; still sick in quarters July 31.

No. 114. Company M: Undetermined fever, July 18; furloughed from Leiter Hospital August 13. In hospital this case was diagnosed typhoid fever.

No. 115. Company A: Sent to division hospital without diagnosis July 18. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 116. Company G: Indigestion, July 19; furloughed September 20. In hospital this case was diagnosed typhoid fever.

No. 117. Company L: Sent to Leiter Hospital July 19 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 12.

No. 118. Company K: Indigestion, July 19; still sick in quarters July 31.

No. 119. Company G: Indigestion, July 19; still sick in quarters July 31.

No. 120. Company G: Sent to Leiter Hospital July 19 without diagnosis. Here the disease was diagnosed malarial fever, and the patient was returned to duty August 1.

No. 121. Company H: Malaria, July 20; still sick September 30.

No. 122. Company K: Malaria, July 20; still sick September 30.

No. 123. Company F: Sent to division hospital July 29 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 124. Company I: Malaria, August 2; furloughed from division hospital September 2. In hospital this case was diagnosed typhoid fever.

No. 125. Company L: Malaria, August 2; still sick in division hospital August 31.

No. 126. Company L: Indigestion, August 2; still sick in division hospital August 31.

No. 127. Company M: Malaria, August 2; still sick in division hospital August 31.

No. 128. Company H: Indigestion, August 2; still sick in division hospital August 31.

No. 129. Company B: Malaria, August 2; still sick in division hospital August 31.

No. 130. Company G: Sent to division hospital August 2 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 30.

No. 131. Company G: Sent to division hospital August 3 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 3.

No. 132. Band: Indigestion, August 4; still sick in division hospital August 31.

No. 133. Company H: Indigestion, August 4; still sick in division hospital August 31.

No. 134. Company D: Indigestion, August 4; still sick in division hospital August 31.

No. 135. Company A: Malaria, August 4; still sick September 30.

No. 136. Company D: Malaria, August 5; still sick September 30.

No. 137. Company G: Indigestion, August 5; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 138. Company D: Malaria, August 5; still sick September 30.

No. 139. Company B: Malaria, August 5; still sick September 30.

No. 140. Company B: Indigestion, August 6; still sick September 30.

No. 141. Company L: Malaria, August 6; still sick September 30.

No. 142. Company F: Malaria, August 6; still sick September 30.

No. 143. Company M: Indigestion August 6; still sick September 30.

No. 144. Company A: Malaria, August 6; still sick in quarters August 31.

No. 145. Company F: Sent to division hospital August 6 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 29.

No. 146. Company C: Malaria, August 6; still sick August 31.

No. 147. Company A: Indigestion, August 6; still sick August 31.

No. 148. Company G: Malaria, August 6; still sick in division hospital August 31.

No. 149. Company K: Malaria, August 6; furloughed from division hospital August 30. In hospital this case was diagnosed typhoid fever.

No. 150. Company A: Malaria, August 6; still sick in hospital August 31.

No. 151. Company H: Malaria, August 6; still sick August 31.

No. 152. Company C: Malaria, August 6; furloughed from division hospital October 18. In hospital this case was diagnosed typhoid fever.

No. 153. Company D: Malaria, August 7; still sick August 31.

No. 154. Company B: Malaria, August 7; still sick September 30.

No. 155. Band: Malaria, August 7; furloughed from division hospital September 5. In hospital this case was diagnosed typhoid fever.

No. 156. Company H: Malaria, August 7; still sick September 30.

No. 157. Company L: Malaria, August 7; sick in quarters August 31.

No. 158. Company I: Malaria, August 7; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 159. Company F: Indigestion, August 8; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 160. Company B: Malaria, August 8; furloughed from division hospital November 13. In hospital this case was diagnosed typhoid fever.

No. 161. Company G: Malaria, August 8; furloughed from division hospital August 29. In hospital this case was diagnosed typhoid fever.

No. 162. Company C: Indigestion, August 8; still sick in division hospital August 31.

No. 163. Company E: Malaria, August 8; furloughed from division hospital August 29. In hospital this case was diagnosed typhoid fever.

No. 164. Company L: Malaria, August 8; still sick September 30.

No. 165. Company F: Indigestion, August 8; still sick August 31.

No. 166. Company F: Malaria, August 9; still sick September 30.

No. 167. Company M: Malaria, August 9; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 168. Company K: Malaria, August 9; still sick September 30.

No. 169. Company K: Malaria, August 9; still sick September 30.

No. 170. Company A: Malaria, August 9; still sick September 30.

No. 171. Company L: Malaria, August 10; still sick September 30.

No. 172. No company: Malaria, August 10; still sick August 31.

No. 173. Company B: Malaria, August 11; died in division hospital August 16.

No. 174. Company B: Malaria, August 11; still sick August 31.

No. 175. Company B: Malaria, August 11; still sick August 31.

No. 176. Company B: Malaria, August 12; still sick August 31.

No. 177. Company M: Malaria, August 12; still sick in division hospital August 31.

No. 178. Company D: Malaria, August 12; still sick in division hospital August 31.

No. 179. Company D: Malaria, August 12; furloughed from division hospital August 31. In hospital this case was diagnosed typhoid fever.

No. 180. Company D: Malaria, August 12; still sick September 30.

No. 181. Company H: Malaria, August 12; still sick September 30.

No. 182. Company K: Malaria, August 12; still sick September 30.

No. 183. Company H: Malaria, August 12; still sick September 30.

No. 184. Company H: Malaria, August 12; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 185. Company F: Malaria, August 13; furloughed from division hospital August 25. In hospital this case was diagnosed typhoid fever.

No. 186. Company E: Malaria, August 13; still sick September 30.

No. 187. Company M: Indigestion, August 13; furloughed from division hospital August 31. In hospital this case was diagnosed typhoid fever.

No. 188. Company C: Malaria, August 13; still sick September 30.

No. 189. Company G: Malaria, August 13; furloughed from division hospital August 31. In hospital this case was diagnosed typhoid fever.

No. 190. Company I: Malaria, August 13; still sick in quarters August 31.

No. 191. Company E: Malaria, August 13; still sick September 30.

No. 192. Hospital Corps: Malaria, August 13; still sick September 30.

No. 193. Company I: Sent to division hospital without diagnosis August 13. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 28.

No. 194. Company K: Malaria, August 13; still sick September 30.

No. 195. Company D: Malaria, August 14; still sick September 30.

No. 196. Company G: Malaria, August 14; still sick September 30.

No. 197. Company L: Malaria, August 14; still sick September 30.

No. 198. Company I: Malaria, August 14; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 199. Company F: Malaria, August 14; still sick September 30.

No. 200. Company I: Malaria, August 14; furloughed September 9.

No. 201. Company K: Malaria, August 14; still sick September 30.

No. 202. Company D: Malaria, August 14; still sick September 30.

No. 203. Company I: Malaria, August 14; still sick September 30.

No. 204. Company D: Malaria, August 15; still sick September 30.

No. 205. Company L: Malaria, August 15; still sick September 30.

No. 206. Company L: Malaria, August 15; still sick September 30.

No. 207. Company F: Malaria, August 15; still sick September 30.

No. 208. Company D: Malaria, August 15; furloughed from division hospital August 30. In hospital this case was diagnosed typhoid fever.

No. 209. Company I: Indigestion, August 15; still sick September 30.

No. 210. Company K: Malaria, August 15; furloughed from division hospital August 30. In hospital this case was diagnosed typhoid fever.

No. 211. Company B: Malaria, August 15; still sick November 2.

No. 212. Company L: Malaria, August 15; furloughed August 29.

No. 213. Company H: Malaria, August 15; furloughed September 14 from division hospital.

No. 214. Company F: Malaria, August 15; still sick September 30.

No. 215. Company D: Malaria, August 16; still sick September 30.

No. 216. Company B: Sent to division hospital August 16 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 5.

No. 217. Company I: Malaria, August 16; still sick September 30.

No. 218. Company C: Malaria, August 16; still sick September 30.

No. 219. Company L: Malaria, August 16; still sick September 30.

No. 220. Company G: Malaria, August 16; still sick September 30.

No. 221. Company H: Sent to division hospital August 16 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 222. Company I: Malaria, August 16; furloughed from division hospital August 30. In hospital this case was diagnosed typhoid fever.

No. 223. Company L: Malaria, August 16; still sick in quarters August 31.

No. 224. Company L: Malaria, August 16; still sick in quarters August 31.

No. 225. Band: Sent to Sternberg Hospital August 16 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 226. Company G: Sent to Sternberg Hospital August 16 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 2.

No. 227. Company F: Malaria, August 16; still sick September 30.

No. 228. No company: Sent to Sternberg Hospital August 16 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 18.

No. 229. Company E: Malaria, August 16; still sick September 30.

No. 230. Company D: Sent to Sternberg Hospital August 16 without diagnosis. Here the disease was diagnosed continued malaria, and the patient was furloughed September 23.

No. 231. Company F: Malaria, August 16; furloughed from division hospital September 20. In hospital this case was diagnosed typhoid fever.

No. 232. Company G: Sent to Sternberg Hospital August 16 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 25.

No. 233. Company D: Malaria, August 16; still sick September 30.

No. 234. Company F: Malaria, August 17; furloughed from division hospital August 30. In hospital this case was diagnosed typhoid fever.

No. 235. Company F: Malaria, August 17; still sick September 30.

No. 236. Company I: Malaria, August 17; furloughed from division hospital August 29. In hospital this case was diagnosed typhoid fever.

No. 237. Company H: Sent to division hospital August 17 without diagnosis. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 9.

No. 238. Company M: Malaria, August 17; still sick September 30.

No. 239. Company H: Malaria, August 17; still sick September 30.

No. 240. Company E: Malaria, August 17; furloughed from division hospital October 7. In hospital this case was diagnosed typhoid fever.

No. 241. Company I: Malaria, August 17; still sick September 30.

No. 242. Company L: Malaria, August 17; furloughed from division hospital October 3. In hospital this case was diagnosed typhoid fever.

No. 243. Company M: Malaria, August 17; furloughed from division hospital September 9. In hospital this case was diagnosed typhoid fever.

No. 244. Company M: Malaria, August 17; still sick September 30.

No. 245. Company A: Malaria, August 17; still sick September 30.

No. 246. Company G: Malaria, August 18; still sick September 30.

No. 247. Company A: Malaria, August 18; still sick September 30.

No. 248. Company L: Malaria, August 18; still sick September 30.

No. 249. Company F: Malaria, August 18; still sick September 30.

No. 250. Company H: Malaria, August 18; still sick September 30.

No. 251. Company F: Malaria, August 18; furloughed from division hospital August 30. In hospital this case was diagnosed typhoid fever.

No. 252. Company I: Malaria, August 18; still sick September 30.

No. 253. Company B: Malaria, August 18; still sick September 30.

No. 254. Company G: Malaria, August 18; furloughed from division hospital September 23. In hospital this case was diagnosed typhoid fever.

No. 255. Company L: Malaria, August 18; still sick September 30.

No. 256. Company A: Malaria, August 18; still sick September 30.

No. 257. Company L: Malaria, August 18; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 258. Company B: Malaria, August 18; still sick September 30.

No. 259. Company M: Malaria, August 18; still sick September 30.

No. 260. Company F: Sent to division hospital August 18 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 29.

No. 261. Company A: Malaria, August 18; still sick September 30.

No. 262. Company D: Malaria, August 18; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 263. Company A: Malaria, August 18; furloughed from division hospital August 31. In hospital this case was diagnosed typhoid fever.

No. 264. Company L: Malaria, August 18; still sick September 30.

No. 265. Company A: Malaria, August 18; furloughed from division hospital August 30. In hospital this case was diagnosed typhoid fever.

No. 266. Company F: Sent to Leiter Hospital August 18 without diagnosis. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 29.

No. 267. Company L: Malaria, August 19; still sick September 30.

No. 268. Company I: Sent to division hospital August 19 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 269. Company A: Malaria, August 19; still sick September 30.

No. 270. Company K: Sent to division hospital August 19 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 5.

No. 271. Company A: Malaria, August 19; still sick September 30.

No. 272. Company D: Sent to Sternberg Hospital August 19 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 24.

No. 273. Company E: Malaria, August 19; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 274. Company I: Sent to Sternberg Hospital August 19 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 24.

No. 275. Company E: Sent to Sternberg Hospital August 19 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 26.

No. 276. Company C: Malaria, August 19; still sick September 30.

No. 277. Company M: Sent to Sternberg Hospital August 19 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 278. Company B: Malaria, August 20; still sick September 30.

No. 279. Company M: Malaria, August 20; still sick September 30.

No. 280. Company G: Malaria, August 20; still sick September 30.

No. 281. Company K: Malaria, August 20; still sick September 30.

No. 282. Company H: Malaria, August 20; still sick September 30.

No. 283. Company L: Malaria, August 20; still sick September 30.
 No. 284. Company C: Sent to division hospital without diagnosis August 20. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 285. Company I: Sent to division hospital without diagnosis August 20. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 286. Company K: Sent to Leiter Hospital without diagnosis August 20. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 8.

No. 287. Company D: Sent to division hospital without diagnosis August 20. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 288. Company L: Sent to division hospital August 20 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was transferred to Sternberg Hospital September 9.

No. 289. Company M: Malaria, August 20; still sick September 30.

No. 290. Company B: Malaria, August 20; still sick September 30.

No. 291. Company G: Malaria, August 20; still sick September 30.

No. 292. Company G: Sent to division hospital without diagnosis August 20. Here the disease was diagnosed typhoid fever and the patient was furloughed September 20.

No. 293. Company H: Malaria, August 20; still sick September 30.

No. 294. Company F: Malaria, August 21; still sick September 30.

No. 295. Company M: Malaria, August 21; furloughed from division hospital September 23. In hospital this case was diagnosed typhoid fever.

No. 296. Company A: Sent to division hospital without diagnosis August 21. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 297. Company L: Sent to division hospital without diagnosis August 21. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 298. Company G: Malaria, August 21; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 299. Company C: Malaria, August 21; still sick September 30.

No. 300. Company M: Sent to division hospital without diagnosis August 21. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 301. Company G: Malaria, August 21; furloughed from division hospital September 15. In hospital this case was diagnosed typhoid fever.

No. 302. Company C: Sent to division hospital without diagnosis August 21. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 15. The initial date of this man's illness is probably July 3, because on this date he was sent to Leiter Hospital. Here the disease was diagnosed remittent malaria, and he was discharged August 18. The record shows that three days later he went to division hospital with typhoid fever. He probably had typhoid fever in Leiter Hospital and had a relapse when he was sent to division hospital.

No. 303. Company K: Malaria, August 21; furloughed from division hospital September 20. In hospital this case was diagnosed typhoid fever.

No. 304. Company D: Sent to division hospital August 21 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 305. Company D: Malaria, August 21; still sick September 30.

No. 306. Company I: Sent to division hospital August 21 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 307. Company G: Malaria, August 21; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 308. Company F: Sent to division hospital without diagnosis August 21. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 309. Company H: Malaria, August 21; still sick September 30.

No. 310. Company D: Malaria, August 21; still sick September 30.

No. 311. Company D: Malaria, August 23; still sick September 30.

No. 312. Company F: Malaria, August 23; still sick September 30.

No. 313. Company D: Malaria, August 23; still sick September 30.

No. 314. Company H: Malaria, August 23; still sick September 30.

No. 315. Company F: Malaria, August 23; still sick September 30.

No. 316. Company C: Malaria, August 23; still sick September 30.

No. 317. Company B: Malaria, August 23; still sick September 30.

No. 318. Company F: Malaria, August 23; still sick September 30.

No. 319. Company H: Malaria, August 23; still sick September 30.

No. 320. Company F: Malaria, August 23; still sick September 30.

No. 321. Company C: Malaria, August 25; still sick September 30.

No. 322. Company D: Malaria, August 25; still sick September 30.

No. 323. Company C: Malaria, August 25; still sick September 30.

No. 324. Company H: Malaria, August 25; still sick September 30.

No. 325. Company D: Malaria, August 25; still sick September 30.

No. 326. Company M: Malaria, August 25; still sick September 30.

No. 327. Company B: Malaria, August 25; still sick September 30.

No. 328. Company K: Malaria, August 25; still sick September 30.

No. 329. Company H: Malaria, August 26; still sick September 30.

No. 330. Company I: Malaria, August 26; still sick September 30.

No. 331. Company D: Malaria, August 26; still sick September 30.

No. 332. Company I: Malaria, August 26; still sick September 30.

No. 333. Company D: Malaria, August 26; still sick September 30.

No. 334. Company F: Malaria, August 26; still sick September 30.

No. 335. Company D: Malaria, August 26; still sick September 30.

No. 336. Company F: Malaria, August 26; still sick September 30.

No. 337. Company H: Malaria, August 26; still sick September 30.

No. 338. Company M: Malaria, August 27; still sick September 30.

No. 339. Company C: Malaria, August 27; still sick September 30.

No. 340. Company L: Malaria, August 27; still sick September 30.

No. 341. Company D: Malaria, August 27; still sick September 30.

No. 342. Company L: Malaria, August 28; still sick September 30.

No. 343. Company A: Malaria, August 28; still sick September 30.

No. 344. Company K: Malaria, August 29; still sick September 30.

No. 345. Company K: Malaria, August 29; still sick September 30.

No. 346. Company K: Malaria, August 29; still sick September 30.

No. 347. Company A: Malaria, August 29; still sick September 30.

No. 348. Company B: Malaria, August 29; still sick September 30.

No. 349. Company I: Malaria, August 29; still sick September 30.

No. 350. Company A: Malaria, August 29; still sick September 30.

No. 351. Company G: Malaria, August 30; still sick September 30.

No. 352. Company B: Malaria, August 30; still sick September 30.

No. 353. Company M: Malaria, August 30; still sick September 30.

No. 354. Company B: Malaria, August 30; still sick September 30.

No. 355. Company H: Malaria, August 30; still sick September 30.

No. 356. Company G: Malaria, August 30; still sick September 30.

No. 357. Company H: Malaria, August 30; still sick September 30.

No. 358. Company M: Malaria, August 30; still sick September 30.

No. 359. Company H: Malaria, August 30; still sick September 30.

No. 360. Company G: Malaria, August 30; still sick September 30.

No. 361. Company H: Malaria, August 30; still sick September 30.

No. 362. Company D: Malaria, August 31; still sick September 30.

No. 363. Company G: Malaria, August 31; still sick September 30.

No. 364. Company D: Malaria, August 31; died September 9.

No. 365. Company M: Typhoid fever, August 31; still sick September 30.

No. 366. Company M: Typhoid fever, August 31; still sick September 30.

No. 367. Company B: Typhoid fever, August 31; still sick September 30.

No. 368. Company B: Typhoid fever, August 31; still sick September 30.

No. 369. Company G: Typhoid fever, August 31; still sick September 30.

No. 370. Company B: Intermittent malaria, August 31; still sick September 30.

No. 371. Company B: Diarrhea, September 1; died September 10.
 No. 372. Company K: Typhoid fever, September 1; still sick October 31.
 No. 373. Company K: Remittent malaria, September 1; still sick October 31.
 No. 374. Company E: Typhoid fever, September 1; still sick October 16.
 No. 375. Company L: Typhoid fever, September 1; still sick October 31.
 No. 376. Company E: Remittent malaria, September 1; still sick October 2.
 No. 377. Company G: Remittent malaria, September 1; still sick October 22.
 No. 378. Company F: Typhoid fever, September 1; furloughed November 5.
 No. 379. Company G: Typhoid fever, September 1; furloughed November 5.
 No. 380. Company G: Typhoid fever, September 1; still sick in quarters October 16.
 No. 381. Company L: Intermittent malaria, September 1; still sick in quarters October 18.
 No. 382. Company I: Typhoid fever, September 1; still sick October 16.
 No. 383. Company K: Typhoid fever, September 1; furloughed October 5.
 No. 384. Company F: Intermittent malaria September 1; still sick October 22.
 No. 385. Company H: Malaria, September 2; still sick September 31.
 No. 386. Company B: Malaria, September 2; still sick October 31.
 No. 387. Company H: Intermittent malaria, September 2; still sick October 4.
 No. 388. Company G: Gastritis, September 2; still sick October 1.
 No. 389. Company K: Catarrhal jaundice, September 2; still sick October 31.
 No. 390. Company B: Undetermined fever, September 3; died September 19.
 No. 391. Company L: Malaria, September 3; still sick October 31.
 No. 392. Company M: Malaria, September 3; still sick October 31.
 No. 393. Company B: Typhoid fever, September 3; furloughed October 6.
 No. 394. Company L: Remittent malaria, September 3; still sick October 2.
 No. 395. Company K: Typhoid fever, September 4; furloughed October 4.
 No. 396. Company G: Remittent malaria, September 4; furloughed October 1.
 No. 397. Company C: Malaria, September 5; still sick October 31.
 No. 398. Company E: Malaria, September 6; still sick October 31.
 No. 399. Company C: Typhoid fever, September 6; furloughed October 30.
 No. 400. Company C: Remittent malaria, September 6; furloughed October 3.
 No. 401. Company B: Remittent malaria, September 6; still sick October 18.
 No. 402. Company A: Malaria, September 7; still sick October 31.
 No. 403. Company I: Malaria, September 8; still sick October 31.
 No. 404. Company M: Typhoid fever, September 8; furloughed October 28.
 No. 405. Company D: Typhoid fever, September 8; furloughed from hospital October 27.
 No. 406. Company D: Remittent malaria, September 8; still sick in hospital October 31.
 No. 407. Company A: Typhoid fever, September 8; furloughed from hospital November 1.
 No. 408. Company A: Malaria, September 9; still sick October 31.
 No. 409. Company B: Malaria, September 10; still sick October 31.
 No. 410. Company M: Malaria, September 12; still sick September 30.

No. 411. Company M: Indigestion, September 13; died September 30.
 No. 412. Company F: Typhoid fever, September 13; still sick in hospital October 31.
 No. 413. Company G: Malaria, September 14; still sick September 30.
 No. 414. Company G: Malaria, September 14; still sick October 31.
 No. 415. Company H: Malaria, September 19; still sick October 31.
 No. 416. Company C: Malaria, September 19; still sick October 31.
 No. 417. Company A: Malaria, September 19; still sick October 31.
 No. 418. Company A: Sent to Sternberg Hospital September 19 without diagnosis. Here the disease was diagnosed typhoid fever and the patient was furloughed November 5.
 No. 419. Company B: Fever, September 21; still sick in hospital at New Ulm November 5.
 No. 420. Company K: Fever, September 22; still sick in hospital November 5.
 No. 421. Company C: Fever, September 22; still sick in hospital November 5.
 No. 422. Company D: Malaria, September 29; still sick October 31.
 No. 423. Company L: Fever, October 1; still sick in hospital at New Ulm November 5.
 No. 424. Company I: Fever, October 6; still sick in hospital at New Ulm November 5.
 No. 425. Company H: Fever, October 9; still sick in hospital at New Ulm November 5.
 No. 426. Company K: Fever, October 13; still sick in hospital at New Ulm November 5.
 No. 427. Company H: Fever, October 28; sick in hospital at New Ulm November 5.
 No. 428. Company C: Fever, October 30; sick in hospital at New Ulm November 5.
 No. 429. Company M: Fever, October 30; sick in hospital at New Ulm November 5.
 No. 430. Company L: Fever, October 31; sick in hospital at New Ulm November 5.
 No. 431. Company B: Fever, October 31; sick in hospital at New Ulm November 5.
 No. 432. Company B: Typhoid fever, November 2; mustered out December 21.
 No. 433. Company I: Typhoid fever November 2; discharged December 21.

The last two cases were from Fort Thomas, and were probably sent to this place before the regiment left Lexington, Ky. It will be seen that there is a break in the cases of supposed typhoid fever from July 20 to August 2. This is due to the fact that the cases left incomplete in July were not carried to the August report. How many of these were typhoid fever we can not tell. There were in all 101 incomplete cases left in the July report and not connected with any subsequent report. It will be erroneous to suppose from the record that typhoid fever ceased to appear July 20 and that there was but one case between that time and August 2. As stated earlier in our history of this regiment, the records were so poorly kept that many cases of probable typhoid fever have undoubtedly escaped our efforts to detect them.

SUMMARY.

Assembled at Camp Ramsey, St. Paul, Minn., April 29, 1898.
 Mustered into United States service May 6 and 7, 1898.
 Arrived at Chickamauga Park May 20, 1898.
 Strength on arrival, 1,032.
 Date of first case of probable typhoid fever May 20, 1898.
 Date of first case of recognized typhoid fever June 1, 1898.

Left Chickamauga Park August 23, 1898.	
Strength on departure, 1,299.	
Number of cases of probable typhoid fever developed at Chickamauga	320
Arrived at Lexington, Ky., August 25, 1898.	
Left Lexington, Ky., September 15, 1898.	
Number of cases of probable typhoid fever developed at Lexington, Ky.	96
Arrived at New Ulm, Minn., September 17, 1898.	
Number of cases of probable typhoid fever developed at New Ulm up to October 31, 1898	17
Total number of cases of probable typhoid fever developed in the Twelfth Minnesota Volunteer Infantry from May to October, inclusive	433
These 433 cases were diagnosed as follows:	
Typhoid fever	144
Malaria	202
Indigestion	49
Undetermined fever	31
Diarrhea	4
Colitis	1
Catarrhal jaundice	1
Gastritis	1
Total	433

The following is an alphabetical list of the total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Beaudelt, Albert A ..	Pvt., M.	July 11	Fort Thomas, Ky.	Typhoid.
Bejeck, Fred	Band ..	Aug. 11	Camp Thomas, Ga.	Do.
Bell, Oliver	Corpl. D	Sept. 9	Do.	Do.
Bennett, Elsha O.	Sgt., M.	Sept. 30	New Ulm, Minn.	Do.
Bundrick, Carl	Pvt., B.	Aug. 13	Camp Thomas, Ga.	Enteric fever.
Brown, C. Leon	Pvt., D.	Aug. 20	do	Disease not stated.
Chapen, Harvey A.	Sgt., G.	Aug. 23	do	Typhoid.
Dickelnick, Wm. F.	Pvt., B.	Sept. 9	Dundas, Minn.	Do.
Hurd, Wallace A.	Pvt., M.	June 23	Camp Thomas, Ga.	Do.
Jakusz, Joseph	Pvt., E.	July 19	Fort Thomas, Ky.	Purpura hemorrhagica.
McDermott, Fred, E.	Pvt., F.	Sept. 13	St. Paul, Minn.	Typhoid.
Mikkelson, Mikel	Pvt., G.	Aug. 19	Camp Thomas, Ga.	Typhoid and acute pneumonia.
Mueller, Louis	1st Lt., F.	Sept. 1	New Ulm, Minn.	Typhoid.
Myers, Harry	Pvt., M.	Aug. 13	No place given	Typhoid and pneumonia.
Kaiser, Joseph	Pvt., E.	Sept. 15	City and County Hospital at St. Paul, Minn.	Typhoid.
Kennedy, Thomas J.	Pvt., B.	Sept. 10	Camp Hamilton, Ky.	Do.
Paulsen, Christian	Pvt., G.	Aug. 30	do	Do.
Roell, C. E.	Sgt., B.	Sept. 19	do	Do.
Sandburg, Norman	Pvt., F.	Sept. 16	St. Paul, Minn.	Do.

The only two deaths in this list not attributed to typhoid fever in the official records at Washington are Brown and Jakusz. The regimental and the hospital records show that both of these men had typhoid fever. Consequently all the deaths in this regiment were due to this disease. Calculated on a total of 433 probable cases, 19 deaths give a death rate of a little more than 4.38 per cent. Calculated on the recognized cases, 144 in number, this would give a death rate of 13.19 per cent. In our opinion these figures show that our total of probable cases more nearly represents the actual number of cases of typhoid fever than is represented by the number of recognized cases.

COMMUNICATIONS FROM THE SURGEONS OF THE TWELFTH MINNESOTA VOLUNTEER INFANTRY.

Medical officers.

Thomas C. Clark, major and surgeon, Stillwater, Minn.
William H. Caine, captain and assistant surgeon, Minneapolis, Minn.
William H. Rowe, lieutenant and assistant surgeon, St. James, Minn.

Captain Caine states:

The location of our camp at Chickamauga was poor. The south end of the ground occupied by us as a camp site was 20 feet higher than the remaining portion, causing in time of rain storms a flooding of two-thirds of the camp with the filth coming from the higher ground. The soil did not exceed 2 inches in depth and was mostly clay, with underlying rock. Sinks could not be properly constructed, and they were not carefully policed. The refuse from the kitchens was dumped into the company sinks. I have seen large pieces of decomposing meat and vegetables, old shoes, and portions of clothing in mess sinks, with but a sprinkling of earth on top. The water supply was insufficient to give the men enough for drinking purposes and for cleanliness of person. The water had to be hauled in barrels 8 miles, and this was of a poor quality, forming a sediment on standing. There was but little of the water used before boiling. The heat was intolerable from the day we arrived until our departure, the daily average temperature from 5 a. m. to 8 p. m. in hospital tent being about 100° F. After 8 p. m. there was a heavy dew, causing tents and bedclothing to become very damp, mold to form on shoes and rust on guns and side arms, if at all exposed to this dampness. Rain fell daily for a period of five weeks in showers, filling up depressions in the ground, and afterwards green fungi formed on the surface of the water and on the earth upon which the water had stood. Men who bathed in Chickamauga Creek almost invariably became sick in consequence thereof. The cooks were careless in having too much grease in all kinds of meat, beans, and mush. The bacon issued was frequently bad. Maggots held high carnival in the sinks. Camps were in too close proximity to each other. The atmosphere was laden with the odor emanating from insanitary sinks and unclean men. The regimental hospitals were dirty, and the division hospitals were in a most insanitary condition.

The location of our camp at Lexington, Ky., was superb, and the water supply was beyond question. No sickness occurred there except among men infected at Chickamauga. The same is true of our camp at New Ulm, Minn.

Captain Rowe states:

The camp of the Twelfth Minnesota Volunteer Infantry at Chickamauga was situated on sloping ground in the woods, and about one-half a mile from Chickamauga Creek, near the site of the old Alexander House. Our water supply was at first from a spring near the Alexander Bridge, 1 mile from camp. Afterwards we obtained water from Blue Rock Spring, about 4 miles distant, and finally from a tubular well sunk in the vicinity of camp. On account of the rocky nature of the soil sinks could not be properly constructed. Moreover, the clay thrown from the sinks in digging did not absorb the fluid contents when returned to the pit, and we had no material to use in filling the sinks. It was absolutely impossible to keep the sinks in a sanitary condition without the use of disinfectants, and these we were unable to obtain until the summer was well-nigh gone and our men badly infected with typhoid fever. Although we made requisition after requisition for disinfectants soon after going into camp we obtained only 3 or 4 barrels of lime during the entire summer. We were told that it was a reflection upon the policing of the camp if disinfectants were needed. In my opinion the Medical Department at Washington did not understand the conditions as they existed in Chickamauga Park. Had they known that open sinks, dug in impervious soil and rock, were used they would certainly have known that dis-

infectants must be used to prevent the spread of infectious diseases. Our sick roll was very large during the summer. Most of the cases were acute indigestion and diarrhea. Remittent malarial fever came next, and we had quite a number of cases of typhoid fever, although we were not as badly afflicted with the last-mentioned disease as some neighboring regiments. I believe that the first cases of typhoid fever were from infected drinking water. Perhaps the infection did not come from the spring water, but the men would drink water from any source. The cases of malaria arose from bathing in Chickamauga Creek, and had we had a plentiful supply of pure water in camp for bathing, our men would have escaped this disease to a great extent. The cases of indigestion and diarrhea were largely due to indiscretions in diet.

Major Clark writes:

The regiment arrived at Chickamauga after dark on the evening of May 19, 1898, and the only water obtainable that night was from Chickamauga Creek. The next day, and for a few days after, water was obtained from a small spring in the vicinity of Alexander Bridge. Later, the chief water supply for the regiments in the vicinity of the Twelfth Minnesota was obtained from Blue Springs, about $2\frac{1}{2}$ miles from Alexander Bridge, from driven wells, and from Park Spring, about 6 miles northwest of Camp Thomas. The question of the water supply of Camp Thomas has been pretty freely discussed and opinions differ. My personal opinion is that the water of Chickamauga Creek was contaminated, and I do not see how it could be otherwise, as it drained an area on which there were hundreds of typhoid-fever cases, the surface drainage of which went into that stream. The principal causes of infection, however, were the flies and the dust. The flies had free access to the uncovered sinks, and the dust permeated everything. The water supply at the fair grounds (Camp Ramsey) was from the city waterworks of St. Paul. I do not think that any cases originated there, as neither the Thirteenth nor Fourteenth Minnesota developed any cases within a period that would indicate it.

The camp of the Twelfth Minnesota at Lexington was located about 6 miles from the city in a large field. The sinks were dug deep and covered over. The water supply was from a large living spring and the sanitary conditions were of the best.

I know nothing of the camp at New Ulm, Minn. A case of typhoid developed in the Fifth Pennsylvania within a few days after their arrival at Camp Thomas, but that regiment did not have a large number of typhoid cases until July.

I do not think that cases Nos. 1 and 2 were typhoid. The change of climate, hot weather, and heavy food caused a good deal of intestinal trouble the first two weeks we were there. I had an attack of diarrhea and intestinal indigestion, which lasted fully as long as cases Nos. 1 and 2, but from which I fully recovered. I think No. 3 is the first case of typhoid developed in the regiment.

The reason for the number of cases of undetermined fever sent to the hospitals is that after June 15 all cases appearing at sick call with a temperature of 100 or over were sent immediately to the hospital before an exact diagnosis could be made, and later on, when the division hospital became crowded, many cases were sent direct to Sternberg and Leiter hospitals from the regiments.

When the fever cases first appeared in the hospital, there were some differences of opinion among the staff as to the character of it, some holding that it was more of a malarial character than typhoid. About the 1st of July Maj. J. D. Griffith, chief surgeon of division; Maj. W. S. Stewart, Ninth Pennsylvania, and myself, made a diagnosis of 75 cases, 25 of which we all agreed were typhoid, 25 we all agreed were suspected typhoid, and the other 25 we could not agree upon. I checked these latter cases up as they developed and about 80 per cent of them proved to be typhoid. These notes were left behind when I came home sick, and I could never get track of them. The clinical histories of the cases in the Third Division Hospital at Camp Thomas, together with the clinical charts, were boxed up and sent to Washington, after my return home.

According to my recollection there were about 1,300 cases treated in the Third Division Hospital, Camp Thomas, between June 10 and August 30, during my connection with it. I should estimate that about 900 of them were diagnosed as typhoid. I think that there were 62 deaths during that period, about 55 of them from typhoid fever.

My recollection is that about 225 or 250 cases were sent to the hospital from the Twelfth Minnesota during that period, possibly more.

There were undoubtedly many mild cases treated in the regiment which never appeared at the division hospital. There were two types of the disease prevalent, one very mild in character without any marked symptoms, the patient often remaining on duty until the second week of the disease. The most virulent cases came from the Second Battalion of the Ninth Pennsylvania. This regiment was located on a rocky ridge, and this battalion obtained its water supply from a driven well located at the foot of a small ravine leading down from the ridge. It was supposed that this well became contaminated either from surface drainage or from drainage from the sinks down through the shaly rock.

In connection with the question of malaria, I wish to cite the case of Private Tally, of the First South Carolina. He had a very severe attack of typhoid fever, with profuse hemorrhages and a persistent high temperature, with intermissions. However, I saw him in consultation with Doctor Lawson, of the First South Carolina, on my staff, in whose ward he was, and recommended that he give him large doses of quinine, which he did, with a very satisfactory lowering of temperature. As his typhoid symptoms subsided the malarial became more pronounced. His convalescence was tedious and was complicated by a relapse, brought on by his anxiety to go home on a furlough. I can not but feel that this was a case of typho-malarial infection. Most of the cases were characterized by an intermittent fever, which is well shown on the two or three hundred clinical charts, which I suppose are in Washington.

I regret that I had neither the time nor the opportunity to make blood examinations, owing to the lack of sufficient help. Many cases came to the hospital in an advanced stage of typhoid and had reported on sick call only a day or two before. One case from the Eighth Massachusetts, admitted at 3 p. m. with a diagnosis of intestinal indigestion, died that evening at 7. A post-mortem revealed it to be an advanced case of typhoid, and death was undoubtedly caused by exhaustion, due to remaining on duty in that condition, as he had first reported to the regimental surgeon the day before. A case from the Twelfth Minnesota died forty-eight hours after admission, and had only been on sick report two days before admission. This man had enormous ulcerated patches in the bowel.

My own case of typhoid was contracted from infected dust, which I think was nearly as important a factor as the flies in carrying infection.

I would like to state that we were convinced in the hospital of the prevalence of typhoid long before it could be impressed upon headquarters, where there seemed to be a tendency to discredit the number of cases reported.

I think that your estimate of the number of cases of probable typhoid in the Twelfth Minnesota is somewhat high. In my judgment I would make the following estimate:

Typhoid fever.....	144
Malaria.....	180
Indigestion.....	25
Undetermined fever.....	31
Total.....	380

This would make the per cent of deaths, counting them all typhoid, 5.

This coincides with an estimate I made in the hospital of cases treated there, but of course I did not include those who died after being sent to other hospitals, and of which I had no knowl-

edge. I now think that the percentage of deaths from typhoid among those treated in or passing through the Third Division Hospital was about 6 per cent. This was a low mortality for the conditions under which the men were received and treated. Excessive drill in the extremely hot weather of May, June, and July, sleeping on the damp ground in the woods, indiscretions in eating and drinking, especially of ice-cold beer immediately after coming in from drill, the depression incident to the failure to get into active service, following the close of the war in July, and the consequent nostalgia, were predisposing causes enervating the men and rendering them susceptible to infection. The overcrowded conditions of the hospitals, insufficient and inefficient nurses in the division hospitals at Chickamauga, the inability to use the cold baths as fully as needed, the necessity of moving patients in the critical stage of the disease, all contributed somewhat to the mortality which, after all, I think was low, taking into consideration all the circumstances.

With the possible exception of the water from Chickamauga Creek and the well before mentioned, I think that the water had little to do with the origin or spread of the disease. The typhoid excreta on the grounds impregnating the dust, the open sinks through the medium of the flies did the business.

FIRST SOUTH CAROLINA VOLUNTEER INFANTRY.

We desire to state in this place only a few facts in regard to this regiment. It arrived at Chickamauga June 7, 1898, and departed for Jacksonville, Fla., July 29, 1898. A discussion of typhoid fever in this regiment will be found in the list of regiments of the Seventh Army Corps. We only wish to state here that this regiment reached Chickamauga infected with typhoid fever, as it had during its stay at this place 15 cases of recognized typhoid fever, 2 deaths from recognized typhoid fever, and 7 deaths in all. For further particulars concerning this regiment the reader is referred to the Seventh Army Corps.

EIGHTH MASSACHUSETTS VOLUNTEER INFANTRY.

Second Brigade, Third Division, First Army Corps.

This regiment assembled May 5 at South Framingham, Mass. It remained at this place until May 16, when it departed for Chickamauga Park, Ga., arriving on the evening of May 19. May 20 it went into permanent camp at Chickamauga. Major Cogswell makes the following statement:

The prevailing disease has been gastro-enteritis, due to lack of fresh meats, insufficiency of drinking water, and change from a cool climate to a hot one. The water apparently contains laxative substances; excessive drill is also believed to influence the health. All drinking water is being boiled. From my personal notes in 200 cases of gastro-enteritis blood is claimed to have been present in the stools. One hundred cases of this disease had a temperature of 104° F. or more, falling to normal within forty-eight hours when given boiled milk, boiled water, fresh beef juice, salts, and stimulants.

CONDENSED SICK REPORT FOR MAY.

Mean strength.....	932
Diarrhea.....	7
Dysentery.....	11
Gastro-enteritis.....	21
Other diseases.....	48
Total.....	87

The first entry on this record is made May 11. One case of gastro-enteritis died. This was a private in Company C, who was taken sick May 28 and died at 9.20 p. m. May 29. There is no record of autopsy.

There are no sick reports for this regiment for June, July, and August. This is to be especially regretted, because this is the one regiment whose medical officers claim to have used exclusively boiled water all the time it was at Chickamauga.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength, not given.....	
Gastro-enteritis.....	516
Diarrhea.....	52
Remittent malaria.....	86
Intermittent malaria.....	1
Typhoid fever.....	27
Other diseases.....	26
Total.....	708

In the absence of regimental sick reports we have been compelled to rely exclusively upon hospital records for information concerning the sick in this regiment. The following is a list of recognized and suspected typhoid cases in this regiment, as shown by hospital records:

No. 1. Company C: Gastro-enteritis, May 28; died May 29. This is the case already referred to, and, of course, we can not say that it was a case of typhoid fever; but this is a possibility.

No. 2. Company C: Sent to Leiter Hospital with typhoid fever July 24; furloughed September 11.

No. 3. Company C: Sent to division hospital July 24 with typhoid fever; furloughed August 26.

No. 4. Company M: Sent to division hospital August 4 with typhoid fever; furloughed September 14.

No. 5. Band: Sent to division hospital August 6, with typhoid fever; furloughed August 22.

No. 6. Company C: Sent to division hospital August 7 with typhoid fever; further disposition not given.

No. 7. Company M: Sent to division hospital August 7 with typhoid fever; furloughed September 13.

No. 8. Company K: Sent to division hospital August 8 with typhoid fever; furloughed August 31.

No. 9. Company G: Sent to division hospital August 8 with typhoid fever; furloughed August 29.

No. 10. Company E: Sent to division hospital August 8 with typhoid fever; furloughed September 13.

No. 11. Company E: Sent to division hospital August 12 with typhoid fever; furloughed September 13.

No. 12. Company B: Sent to division hospital August 12 with typhoid fever; furloughed August 30.

No. 13. Company C: Sent to division hospital August 12 with typhoid fever; furloughed September 13.

No. 14. Company F: Sent to division hospital August 12 with typhoid fever; furloughed September 3.

No. 15. Company F: Sent to division hospital August 13 with typhoid fever; furloughed September 13.

No. 16. Company E: Sent to division hospital August 16 with typhoid fever; furloughed August 31.

No. 17. Company H: Sent to Sternberg Hospital August 16 with typhoid fever; furloughed September 13.

No. 18. Company L: Sent to division hospital August 16 with typhoid fever; furloughed September 18.

No. 19. Company I: Sent to Sternberg Hospital August 16 with typhoid fever; furloughed August 22.

- No. 20. Company H: Sent to Sternberg Hospital August 16 with typhoid fever; furloughed August 27.
- No. 21. Company E: Sent to Sternberg Hospital August 16 with typhoid fever; furloughed August 25.
- No. 22. Company E: Sent to Sternberg Hospital August 16 with typhoid fever; furloughed October 26.
- No. 23. Company H: Sent to Sternberg Hospital August 16 with typhoid fever; furloughed September 13.
- No. 24. Company D: Sent to Sternberg Hospital August 16 with remittent malaria; furloughed September 26.
- No. 25. Company H: Sent to division hospital August 17 with typhoid fever; furloughed August 29.
- No. 26. Company F: Sent to Sternberg Hospital August 17 with typhoid fever; furloughed August 24.
- No. 27. Company F: Sent to division hospital August 17 with typhoid fever; furloughed September 20.
- No. 28. Company H: Sent to Sternberg Hospital August 18 with typhoid fever; furloughed September 3.
- No. 29. Company C: Sent to division hospital August 18 with typhoid fever; furloughed September 13.
- No. 30. Company F: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed September 8.
- No. 31. Company K: Sent to Sternberg Hospital August 19 with malaria; furloughed August 27.
- No. 32. Company K: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed August 27.
- No. 33. Civilian: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed September 17.
- No. 34. Company I: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed September 9.
- No. 35. Company I: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed September 8.
- No. 36. Company M: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed August 24.
- No. 37. Company L: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed September 5.
- No. 38. Company F: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed September 7.
- No. 39. Company K: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed September 8.
- No. 40. Company I: Sent to Sternberg Hospital August 19 with typhoid fever; furloughed September 9.
- No. 41. Company I: Sent to division hospital August 20 with typhoid fever; furloughed September 20.
- No. 42. Company M: Sent to division hospital August 20 with typhoid fever; furloughed September 13.
- No. 43. Company I: Sent to division hospital August 20 with typhoid fever; furloughed September 20.
- No. 44. Company M: Sent to division hospital August 20 with typhoid fever; furloughed September 14.
- No. 45. Company C: Sent to division hospital August 20 with typhoid fever; furloughed September 13.
- No. 46. Company B: Sent to division hospital August 20 with typhoid fever; furloughed September 3.
- No. 47. Company A: Sent to division hospital August 20 with typhoid fever; furloughed September 18.
- No. 48. Company M: Sent to division hospital August 20 with typhoid fever; furloughed October 5.
- No. 49. Company A: Sent to division hospital August 23 with typhoid fever; died September 4.
- No. 50. Company H: Sent to division hospital August 23 with typhoid fever; further disposition not given.
- No. 51. Company B: Sent to division hospital August 23 with typhoid fever; died September 3.
- No. 52. Company D: Sent to division hospital August 23 with typhoid fever; furloughed September 13.
- No. 53. Company B: Sent to division hospital August 23 with typhoid fever; furloughed September 13.
- No. 54. Company I: Sent to division hospital August 23 with typhoid fever; furloughed September 15.
- No. 55. Company I: Sent to division hospital August 23 with typhoid fever; furloughed September 13.
- No. 56. Company B: Sent to division hospital August 25 with typhoid fever; furloughed September 14.
- No. 57. Company M: Sent to division hospital August 26 with remittent malaria; furloughed September 14.
- No. 58. Company M: Sent to division hospital August 26 with intermittent malaria; furloughed September 19.
- No. 59. Company G: Sent to division hospital August 26 with remittent malaria; furloughed September 25.
- No. 60. Company I: Sent to division hospital August 26 with typhoid fever; furloughed October 14.
- No. 61. Company F: Sent to division hospital August 26 with remittent malaria; furloughed September 19.
- No. 62. Company E: Sent to division hospital August 26 with typhoid fever; furloughed October 6.
- No. 63. Company E: Sent to division hospital August 28 with typhoid fever; furloughed October 3.
- No. 64. Company M: Sent to division hospital August 28 with remittent malaria; furloughed September 23.
- No. 65. Company C: Sent to division hospital August 28 with typhoid fever; furloughed October 22.
- No. 66. Company K: Sent to division hospital August 28 with remittent malaria; furloughed September 14.
- No. 67. Company M: Sent to division hospital August 29 with remittent malaria; furloughed September 23.
- No. 68. Company A: Sent to division hospital August 29 with intermittent malaria; furloughed September 17.
- No. 69. Company I: Sent to division hospital August 29 with remittent malaria; furloughed September 10.
- No. 70. Company K: Sent to division hospital August 29 with typhoid fever; furloughed October 12.
- No. 71. Company G: Sent to division hospital August 29 with remittent malaria; furloughed October 14.
- No. 72. Company K: Sent to division hospital August 29 with remittent malaria; furloughed September 17.
- No. 73. Company L: Sent to division hospital August 29 with remittent malaria; furloughed September 10.
- No. 74. Company M: Sent to division hospital August 30 with intermittent malaria; furloughed September 14.
- No. 75. Company F: Sent to division hospital August 30 with typhoid fever; furloughed October 6.
- No. 76. Company A: Sent to division hospital August 31 with typhoid fever; furloughed September 15.
- No. 77. Company D: Sent to division hospital August 31 with typhoid fever; died September 6.
- No. 78. Company H: Sent to division hospital September 1 with typhoid fever; furloughed October 12.
- No. 79. Company F: Sent to division hospital September 1 with typhoid fever; further disposition not given.
- No. 80. Company D: Sent to division hospital September 1 with typhoid fever; furloughed November 1.
- No. 81. Company L: Sent to division hospital September 1 with intermittent malaria; furloughed September 17.
- No. 82. Company M: Sent to division hospital September 1 with typhoid fever; further disposition not given.
- No. 83. Company B: Sent to division hospital September 1 with typhoid fever; furloughed September 4.
- No. 84. Company M: Sent to division hospital September 1 with remittent malaria; furloughed September 19.
- No. 85. Company K: Sent to division hospital September 1 with typhoid fever; furloughed October 28.
- No. 86. Company F: Sent to division hospital September 1 with typhoid fever; furloughed October 5.
- No. 87. Company F: Sent to division hospital September 1 with catarrhal jaundice; furloughed October 3.

No. 88. Company D: Sent to division hospital September 2 with remittent malaria; furloughed September 13.

No. 89. Company H: Sent to division hospital September 2 with remittent malaria; furloughed September 22.

No. 90. Company A: Sent to division hospital September 2 with remittent malaria; furloughed September 13.

No. 91. Company C: Sent to division hospital September 2 with typhoid fever; further disposition not given.

No. 92. Company I: Sent to division hospital September 2 with intermittent malaria; furloughed September 13.

No. 93. Company L: Sent to division hospital September 2 with acute gastritis; furloughed October 23.

No. 94. Company B: Sent to division hospital September 2 with typhoid fever; furloughed October 22.

No. 95. Company I: Sent to division hospital September 2 with remittent malaria; furloughed October 3.

No. 96. Company I: Sent to division hospital September 2 with intermittent malaria; furloughed September 17.

No. 97. Company E: Sent to division hospital September 2 with typhoid fever; furloughed November 3.

No. 98. Company B: Sent to division hospital September 3 with typhoid fever; furloughed October 11.

No. 99. Company G: Sent to division hospital September 3 with intermittent malaria; furloughed September 17.

No. 100. Company E: Sent to division hospital September 3 with typhoid fever; furloughed September 30.

No. 101. Company G: Sent to division hospital September 3 with typhoid fever; died September 19.

No. 102. Company I: Sent to division hospital September 3 with typhoid fever; furloughed October 6.

No. 103. Company M: Sent to division hospital September 3 with typhoid fever; furloughed October 26.

No. 104. Company D: Sent to division hospital September 3 with typhoid fever; furloughed October 6.

No. 105. Company K: Sent to division hospital September 3 with intermittent malaria; furloughed September 14.

No. 106. Company B: Sent to division hospital September 3 with typhoid fever; furloughed September 29.

No. 107. Company K: Sent to division hospital September 3 with remittent malaria; furloughed September 23.

No. 108. Company E: Sent to division hospital September 3 with remittent malaria; furloughed October 6.

No. 109. Company E: Sent to division hospital September 3 with typhoid fever; furloughed October 6.

No. 110. Company K: Sent to division hospital September 4 with typhoid fever; furloughed from Fort Thomas November 16.

No. 111. Company B: Sent to division hospital September 4 with intermittent malaria; furloughed September 23.

No. 112. Company D: Sent to division hospital September 4 with intermittent malaria; furloughed September 23.

No. 113. Company I: Sent to division hospital September 4 with remittent malaria; furloughed November 3.

No. 114. Company K: Sent to division hospital September 4 with typhoid fever; further disposition not given.

No. 115. Company M: Sent to division hospital September 4 with remittent malaria; furloughed September 23.

No. 116. Company K: Sent to division hospital September 4 with typhoid fever; furloughed November 3.

No. 117. Company B: Sent to division hospital September 4 with typhoid fever; died September 13.

No. 118. Company F: Sent to division hospital September 4 with typhoid fever; furloughed October 6.

No. 119. Company I: Sent to division hospital September 4 with remittent malaria; furloughed October 3.

No. 120. Company G: Sent to division hospital September 4 with typhoid fever; furloughed November 1.

No. 121. Company C: Sent to division hospital September 4 with intermittent malaria; furloughed September 14.

No. 122. Company B: Sent to division hospital September 4 with typhoid fever; further disposition not given.

No. 123. Company B: Sent to division hospital September 5 with intermittent malaria; furloughed October 2.

No. 124. Company L: Sent to division hospital September 5 with intermittent malaria; furloughed September 23.

No. 125. Company L: Sent to division hospital September 5 with remittent malaria; furloughed October 23.

No. 126. Company E: Sent to division hospital September 5 with typhoid fever; furloughed October 18.

No. 127. Company A: Sent to division hospital September 5 with typhoid fever; furloughed October 18.

No. 128. Company E: Sent to division hospital September 6 with remittent malaria; furloughed October 11.

No. 129. Company H: Sent to division hospital September 6 with remittent malaria; furloughed October 16.

No. 130. Company E: Sent to division hospital September 6 with remittent malaria; furloughed October 18.

No. 131. Company D: Sent to division hospital September 6 with catarrhal jaundice; furloughed October 17.

No. 132. Company F: Sent to division hospital September 6 with typhoid fever; furloughed October 6.

No. 133. Company C: Sent to division hospital September 6 with intermittent malaria; furloughed October 8.

No. 134. Company E: Sent to division hospital September 7 with remittent malaria; returned to quarters September 23.

No. 135. Company E: Sent to division hospital September 7 with remittent malaria; returned to quarters September 27.

No. 136. Company E: Sent to division hospital September 8 with remittent malaria; furloughed October 12.

No. 137. Company F: Sent to division hospital September 9 with typhoid fever; further disposition not given.

No. 138. Company C: Sent to division hospital September 9 with typhoid fever; further disposition not given.

No. 139. Company L: Sent to division hospital September 9 with remittent malaria; returned to quarters September 22.

No. 140. Company M: Sent to division hospital September 9 with remittent malaria; returned to quarters September 21.

No. 141. Company H: Sent to division hospital September 10 with catarrhal jaundice; returned to duty October 18.

No. 142. Company C: Sent to division hospital September 10 with typhoid fever; further disposition not given.

No. 143. Company C: Sent to division hospital September 10 with remittent malaria; furloughed October 1.

No. 144. Company F: Sent to division hospital September 11 with remittent malaria; returned to quarters September 23.

No. 145. Company B: Sent to division hospital September 11 with typhoid fever; further disposition not given.

No. 146. Company E: Sent to division hospital September 11 with typhoid fever; furloughed October 10.

No. 147. Company B: Sent to division hospital September 11 with typhoid fever; furloughed October 28.

No. 148. Company B: Sent to division hospital September 12 with remittent malaria; furloughed October 27.

No. 149. Company I: Sent to division hospital September 12 with typhoid fever; furloughed from Fort Thomas September 22.

No. 150. Company B: Sent to division hospital September 12 with remittent malaria; returned to quarters September 25.

No. 151. Company G: Sent to division hospital September 13 with typhoid fever; furloughed October 18.

No. 152. Company L: Sent to division hospital September 14 with typhoid fever; further disposition not given.

No. 153. Company D: Sent to division hospital September 14 with typhoid fever; discharged December 9.

No. 154. Company A: Sent to division hospital September 15 with typhoid fever; furloughed November 17.

No. 155. Company L: Sent to division hospital September 15 with remittent malaria; returned to quarters October 21.

No. 156. Company M: Sent to division hospital September 15 with remittent malaria; returned to quarters September 27.

No. 157. Company F: Sent to division hospital September 15 with typhoid fever; furloughed October 19.

No. 158. Company K: Sent to division hospital September 15 with intermittent malaria; returned to quarters October 5.

No. 159. Company A: Sent to division hospital September 15 with typhoid fever; furloughed October 3.

No. 160. Company G: Sent to division hospital September 16 with typhoid fever; further disposition not given.

No. 161. Company C: Sent to division hospital September 16 with remittent malaria; furloughed October 10.

No. 162. Company A: Sent to division hospital September 16 with remittent malaria; furloughed October 8.

No. 163. Company A: Sent to division hospital September 17 with remittent malaria; furloughed October 9.

No. 164. Company A: Sent to division hospital September 17 with remittent malaria; furloughed October 28.

No. 165. Company F: Sent to division hospital September 17 with remittent malaria; furloughed October 19.

No. 166. Company I: Sent to division hospital September 17 with typhoid fever; transferred to Fort Thomas November 5.

No. 167. Company G: Sent to division hospital September 19 with typhoid fever; furloughed November 17.

No. 168. Company G: Sent to division hospital September 19 with typhoid fever; transferred to Fort Thomas November 5.

No. 169. Company C: Sent to division hospital September 19 with catarrhal jaundice; returned to quarters October 3.

No. 170. Company E: Sent to division hospital September 20 with typhoid fever; returned to duty December 14.

No. 171. Company H: Sent to division hospital September 20 with typhoid fever; further disposition not given.

No. 172. Company F: Sent to division hospital September 20 with remittent malaria; furloughed October 26.

No. 173. Company F: Sent to division hospital September 20 with typhoid fever; furloughed November 4.

No. 174. Company G: Sent to division hospital September 20 with typhoid fever; furloughed November 1.

No. 175. Company A: Sent to division hospital September 22 with diarrhea; furloughed October 8.

No. 176. Company L: Sent to division hospital September 23 with typhoid fever; further disposition not given.

No. 177. Company C: Sent to division hospital September 23 with typhoid fever; still sick October 31.

No. 178. Company H: Sent to division hospital September 23 with typhoid fever; furloughed October 4.

No. 179. Company G: Sent to division hospital September 23 with typhoid fever; further disposition not given.

No. 180. Company M: Sent to division hospital September 24 with typhoid fever; furloughed November 4.

No. 181. Company C: Sent to general hospital September 24 with typhoid fever; further disposition not given.

No. 182. Company H: Sent to division hospital September 25 with typhoid fever; furloughed November 16.

No. 183. Company C: Sent to division hospital September 25 with typhoid fever; furloughed November 15.

No. 184. Company F: Sent to division hospital September 27 with remittent malaria; furloughed October 18.

No. 185. Company E: Sent to division hospital September 27 with catarrhal jaundice; furloughed October 17.

No. 186. Company G: Sent to division hospital September 28 with remittent malaria; furloughed October 17.

No. 187. Company C: Sent to division hospital September 28 with remittent malaria; furloughed October 10.

No. 188. Company F: Sent to division hospital September 28 with remittent malaria; transferred to Fort Thomas November 2.

No. 189. Company K: Sent to division hospital September 28 with remittent malaria; furloughed October 28.

No. 190. Company K: Sent to division hospital September 28 with typhoid fever; died October 10.

No. 191. Company F: Sent to division hospital September 29 with remittent malaria; furloughed November 1.

No. 192. Company D: Sent to division hospital September 29 with remittent malaria; returned to quarters November 6.

No. 193. Company F: Sent to division hospital September 29 with remittent malaria; furloughed November 1.

No. 194. Company G: Sent to division hospital September 29 with catarrhal jaundice; furloughed November 1.

No. 195. Company K: Sent to division hospital September 29 with remittent malaria; furloughed November 6.

No. 196. Company M: Sent to division hospital September 29 with catarrhal jaundice; returned to quarters October 10.

No. 197. Company H: Sent to division hospital September 29 with catarrhal jaundice; transferred to Fort Thomas November 2.

No. 198. Company F: Sent to division hospital September 30 with remittent malaria; furloughed October 26.

No. 199. Company F: Sent to division hospital September 30 with remittent malaria; furloughed October 24.

No. 200. Company G: Sent to division hospital September 30 with remittent malaria; furloughed October 28.

No. 201. Company D: Sent to division hospital October 1 with typhoid fever; further disposition not given.

No. 202. Company G: Sent to division hospital October 1 with typhoid fever; furloughed October 27.

No. 203. Company I: Sent to division hospital October 1 with typhoid fever; furloughed November 1.

No. 204. Company H: Sent to division hospital October 3 with catarrhal jaundice; furloughed October 27.

No. 205. Company A: Sent to division hospital October 3 with remittent malaria; returned to quarters October 18.

No. 206. Company F: Sent to division hospital October 4 with remittent malaria; furloughed October 28.

No. 207. Company C: Sent to division hospital October 5 with intermittent malaria; returned to quarters October 24.

No. 208. Company C: Sent to division hospital October 5 with remittent malaria; furloughed October 28.

No. 209. Company G: Sent to division hospital October 5 with catarrhal jaundice; returned to quarters October 20.

No. 210. Company L: Sent to division hospital October 5 with catarrhal jaundice; furloughed October 27.

No. 211. Company K: Sent to division hospital October 5 with remittent malaria; furloughed October 27.

No. 212. Company B: Sent to division hospital October 5 with typhoid fever; further disposition not given.

No. 213. Company D: Sent to division hospital October 5 with typhoid fever; furloughed November 17.

No. 214. Company G: Sent to division hospital October 5 with remittent malaria; furloughed October 28.

No. 215. Company M: Sent to division hospital October 5 with typhoid fever; furloughed October 24.

No. 216. Company C: Sent to division hospital October 5 with intermittent malaria; returned to quarters October 27.

No. 217. Company G: Sent to division hospital October 5 with remittent malaria; furloughed October 28.

No. 218. Company I: Sent to division hospital October 5 with typhoid fever; furloughed November 1.

No. 219. Company E: Sent to division hospital October 5 with typhoid fever; transferred to Fort Thomas November 5.

No. 220. Company A: Sent to division hospital October 6 with remittent malaria; returned to quarters October 26.

No. 221. Company G: Sent to division hospital October 6 with typhoid fever; furloughed from Fort Thomas November 15.

No. 222. Company A: Sent to division hospital October 6 with remittent malaria; transferred to Fort Thomas November 2.

No. 223. Company K: Sent to division hospital October 6 with typhoid fever; further disposition not given.

No. 224. Company C: Sent to division hospital October 6 with typhoid fever; further disposition not given.

No. 225. Company F: Sent to division hospital October 6 with remittent malaria; returned to quarters October 24.

No. 226. Company K: Sent to division hospital October 6 with catarrhal jaundice; furloughed October 21.

No. 227. Company M: Sent to division hospital October 7 with remittent malaria; transferred to Fort Thomas November 2.

No. 228. Company F: Sent to division hospital October 8 with remittent malaria; furloughed November 1.

No. 229. Company I: Sent to division hospital October 8 with catarrhal jaundice; furloughed October 19.

No. 230. Company D: Sent to division hospital October 9 with typhoid fever; furloughed October 29.

No. 231. Company L: Sent to division hospital October 9 with typhoid fever; furloughed October 25.

No. 232. Company F: Sent to division hospital October 10 with typhoid fever; discharged from Fort Thomas December 14.

No. 233. Company E: Sent to division hospital October 11 with catarrhal jaundice; furloughed November 2.

No. 234. Company K: Sent to division hospital October 11 with remittent malaria; furloughed November 2.

No. 235. Company D: Sent to division hospital October 11 with remittent malaria; furloughed November 2.

No. 236. Company D: Sent to division hospital October 11 with gastritis; furloughed October 28.

No. 237. Company E: Sent to division hospital October 13 with intermittent malaria; furloughed October 28.

No. 238. Company E: Sent to division hospital October 14 with typhoid fever; discharged December 15.

No. 239. Company C: Sent to division hospital October 14 with catarrhal jaundice; furloughed October 29.

No. 240. Company K: Sent to division hospital October 17 with typhoid fever; transferred to Fort Thomas November 5.

No. 241. Company H: Sent to division hospital October 19 with remittent malaria; transferred to Fort Thomas November 2.

No. 242. Company I: Sent to division hospital October 20 with remittent malaria; transferred to Fort Thomas November 2.

No. 243. Company D: Sent to division hospital October 20 with catarrhal jaundice; furloughed November 1.

No. 244. Company B: Sent to general hospital October 23 with typhoid fever; furloughed November 23.

No. 245. Company C: Sent to division hospital October 23 with remittent malaria; furloughed November 8.

No. 246. Company C: Sent to division hospital October 23 with typhoid fever; further disposition not given.

No. 247. Company B: Sent to division hospital October 24 with typhoid fever; furloughed from Fort Thomas November 17.

No. 248. Company C: Sent to division hospital October 24 with remittent malaria; transferred to Fort Thomas November 5.

No. 249. Company D: Sent to division hospital October 24 with typhoid fever; transferred to Fort Thomas November 5.

No. 250. Company H: Sent to division hospital October 24 with gastritis; transferred to Fort Thomas November 5.

No. 251. Company K: Sent to division hospital November 2 with typhoid fever; furloughed November 4.

No. 252. Company F: Sent to division hospital November 2 with remittent malaria; furloughed November 4.

No. 253. Company L: Sent to Fort Thomas November 2 with malaria; furloughed November 28.

No. 254. Company H: Sent to Fort Thomas November 2 with malaria; returned to duty December 13.

No. 255. Company I: Sent to Fort Thomas November 2 with typhoid fever; discharged December 3.

No. 256. Company E: Sent to Fort Thomas November 2 with typhoid fever; furloughed November 16.

No. 257. Company G: Sent to Fort Thomas November 2 with typhoid fever; furloughed November 4.

No. 258. Company F: Sent to Fort Thomas November 2 with typhoid fever; further disposition not given.

No. 259. Company A: Sent to Fort Thomas November 2 with typhoid fever; died December 1.

No. 260. Company M: Sent to Fort Thomas November 2 with typhoid fever; discharged December 15.

No. 261. Company M: Sent to Fort Thomas November 2 with typhoid fever; discharged December 20.

No. 262. Company K: Sent to division hospital November 3 with typhoid fever; transferred to Fort Thomas November 5.

No. 263. Company A: Sent to Fort Thomas November 5 with typhoid fever; further disposition not given.

No. 264. Company D: Sent to Fort Thomas November 5 with typhoid fever; furloughed November 22.

No. 265. Company K: Sent to Fort Thomas November 5 with typhoid fever; further disposition not given.

No. 266. Company E: Sent to Fort Thomas November 5 with typhoid fever; discharged December 27.

No. 267. Company D: Sent to Fort Thomas November 5 with typhoid fever; furloughed November 11.

No. 268. Company M: Sent to Fort Thomas November 5 with typhoid fever; furloughed November 15.

No. 269. Company L: Sent to Fort Thomas November 5 with typhoid fever; further disposition not given.

No. 270. Company A: Sent to Fort Thomas November 16 with remittent malaria; furloughed December 1.

No. 271. Company K: Sent to Fort Thomas November 16 with typhoid fever; discharged December 16.

No. 272. Company G: Sent to Fort Thomas November 16 with typhoid fever; discharged December 22.

SUMMARY.

Assembled at South Framingham, Mass., May 5, 1898.
 Mustered into United States service May 8, 1898.
 Arrived at Chickamauga Park, Ga., May 20, 1898.
 Strength on arrival, 932.
 Date of first case of probable typhoid fever, May 28, 1898.
 Date of first case of recognized typhoid fever, July 24, 1898.
 Left Chickamauga Park, August 23, 1898.
 Strength on departure, 1,317.
 Number of cases of probable typhoid fever developed at Chickamauga 55
 Arrived at Lexington, Ky., August 25, 1898.
 Number of cases of probable typhoid fever developed after leaving Chickamauga:
 From August 25 to 31 22
 During September 123
 During October 50
 During November 22
 Total number of cases of probable typhoid fever developed in the Eighth Massachusetts Volunteer Infantry from May to November, 1898 272

These 272 cases were diagnosed as follows:

Typhoid fever.....	157
Malaria.....	94
Catarrhal jaundice.....	16
Gastro-enteritis.....	1
Gastritis.....	3
Diarrhea.....	1
Total.....	272

As has been stated, special interest attaches to this regiment because the claim was made that all the water was boiled and that typhoid fever did not occur until relatively late in the summer. Our list of probable cases of typhoid fever corresponds with this view. The opinion was prevalent among medical officers at Chickamauga that typhoid fever did not appear until very late in this regiment and that this was due to the fact that the drinking water was boiled. As illustrating the opinion held by medical officers on this point, we will make a quotation from a report to the Surgeon-General made by Lieutenant-Colonel Woodhull under date of August 7, 1898. Colonel Woodhull states:

There are general instructions to boil all the water, whether filtered or not. In the only regiment where I could be sure that order was actually enforced—Eighth Massachusetts—no typhoid fever has yet been recognized, and although the camp is very low and wet and remittent fever has occurred within the last fortnight, the general sick rate is only 2.56 per cent.

It can be readily seen that it is of considerable importance to determine whether or not our list of probable cases of typhoid fever is correct. Since preparing that list we have obtained reports from a field hospital to which patients from this regiment were sent during June and July. The following cases bear upon this point:

No. 1. Company D: Gastro-enteritis, May 28 to June 6; diarrhea, June 14 to 24.

No. 2. Company B: Diarrhea, May 31 to June 19.

No. 3. Company D: Gastro-enteritis, June 1 to 10; diarrhea, June 17 to July 4.

No. 4. Company G: Diarrhea, June 1 to 12.

No. 5. Company I: Dysentery, May 29 to June 5; gastro-enteritis, June 7 to 21.

No. 6. Company G: Diarrhea, June 22 to 27; diarrhea, July 1 to 10.

No. 7. Company H: Malaria, July 11; furloughed July 28.

No. 8. Company C: Malaria, July 18; sent to division hospital July 22.

No. 9. Company K: Malaria, July 9 to August 17.

No. 10. Hospital steward: Malaria, July 2; furloughed August 1.

No. 11. Company C: Malarial fever, July 11 to August 3.

No. 12. Company D: Malarial fever, July 20; still absent on leave August 23.

In our opinion these cases were most probably typhoid fever, and should be added to our list of probable cases. If this be right, this regiment was not free from typhoid fever as long as indicated by our list.

The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Balch, John P.....	Sgt., A.	1898. Sept. 4	Camp Thomas, Ga....	Typhoid.
Bartol, Clarence L....	Pvt., C.	May 29	Chickamauga, Ga....	Heart dis- ease.
Benson, Charles W....	Pvt., C.	1899. Mar. 15	Hospital ship <i>Missouri</i>	Malarial fever.
Burnham, Herbert O....	Pvt., D.	1898. May 28	Camp Thomas, Ga....	Pneumonia.
Cahoon, William B....	Pvt., G.	Sept. 30	Camp Hamilton, Ky....	Typhoid.
Constine, Kenneth G....	Pvt., G.	Sept. 3	Camp Thomas, Ga....	Do.
Cook, Geo. O.....	Pvt., D.	Sept. 12	Dorchester, Mass.....	No cause given.
Coombs, Rolom G.....	Pvt., B.	Sept. 18	Camp Hamilton, Ky....	Typhoid.
Curley, William D....	Pvt., G.	Oct. 10	.....do.....	Do.
Deasey, Henry A.....	Pvt., H.	Sept. 13	New Hampshire.....	Do.
Doren, John M.....	Corpl., G.	Aug. 4	Camp Thomas, Ga....	Do.
Dottridge, John F....	Pvt., D.	Sept. 6	Lexington, Ky.....	Do.
Downey, Francis H....	(?), I.	Oct. 24	.....do.....	No cause given.
Draper, Frank E.....	Sgt., M.	Sept. 1	Camp Thomas, Ga....	Typhoid.
Dunn, Harvey A.....	Pvt., L.	July 18	.....do.....	Do.
Florence, Wm. H.....	Pvt., C.	Oct. 8	Camp Hamilton, Ky....	Chronic pa- renchymatous nephritis.
Hanson, John F.....	Pvt., L.	Sept. 22	.....do.....	Typhoid.
Hayes, Michael J.....	Pvt., I.	Sept. 15	Camp Thomas, Ga....	Chronic dysentery.
Higgins, Henry.....	Corpl., B.	Sept. 24	Camp Hamilton, Ky....	Typhoid.
Hinckley, Frank A....	Pvt., I.	Aug. 2	Camp Thomas, Ga....	Do.
Hobbs, S. S.....	Pvt., K.	Aug. 19	.....do.....	No cause given.
Lamprey, Timothy O....	Pvt., B.	June 13	.....do.....	Appendi- citis.
Nicholls, John H.....	Corpl., H.	Sept. 17	Camp Hamilton, Ky....	Typhoid.
Patten, George W.....	Corpl., B.	Sept. 6	Amesbury, Mass.....	No cause given.
Pocket, Joseph.....	Pvt., I.	Aug. 26	Chickamauga, Ga....	Typhoid.
Stewart, Clarence R....	Corpl., M.	June 1	Camp Thomas, Ga....	Pneumonia.
Sweeney, Thomas.....	Pvt., B.	Oct. 20	Camp Hamilton, Ky....	Typhoid.
Thomas, Fred.....	Pvt., F.	Sept. 6	Chickamauga, Ga....	Enteric fever.
Thompson, Walter D....	Pvt., I.	Aug. 7	Camp Thomas, Ga....	Typhoid.
Whalen, George F.....	Pvt., G.	Sept. 19	Camp Hamilton, Ky....	Do.

This gives a total of 30 deaths in this regiment, 19 of which are ascribed to typhoid fever. It will be seen that there are several cases in which the cause of death is not stated, but we will figure on 19 as the actual number of deaths from typhoid fever. Nineteen deaths from 272 probable cases gives a death rate of 6.98 per cent, whereas 19 deaths from 157 recognized cases gives a rate of 12.10 per cent. This is additional reason for believing that our number of probable cases of typhoid fever is not too high.

TWENTY-FIRST KANSAS VOLUNTEER INFANTRY.

Second Brigade, Third Division, First Army Corps.

In the May report Maj. Frank Armstrong states:

Two cases of typhoid fever occurred; both are now convalescent. Care was taken to promptly disinfect the excretions of these patients with chloride of lime. The cause was undoubtedly due to old and insanitary buildings at the State fair grounds at Topeka in which the regiment was quartered.

This regiment reached Chickamauga Park, Ga., May 20, and, as is seen from the above remarks of Major Armstrong, it arrived already infected with typhoid fever.

CONDENSED SICK REPORT FROM MAY 20 TO MAY 31, INCLUSIVE.

Mean strength	1,008
Intermittent malaria	7
Acute diarrhea	42
Dysentery	1
Typhoid fever	2
Other diseases	31
Total	83

The 2 cases of typhoid fever were in Company H, and the initial date for both was May 21.

The June report is signed by F. W. Turner, assistant surgeon in charge, who makes no comment.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,320
Intermittent malaria	13
Remittent malaria	15
Acute diarrhea	73
Dysentery	3
Typhoid fever	4
Other diseases	133
Total	241

The recognized cases of typhoid fever include the 2 reported last month and 2 additional. Of the additional ones, 1 belonged to Company K and the other to Company I. There were several other probable cases of typhoid fever in this regiment at this time, as will be seen later.

The July report is without comment.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,294
Intermittent malaria	45
Remittent malaria	147
Acute diarrhea	140
Dysentery	3
Typhoid fever	15
Other diseases	35
Total	385

The August report also is without comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,267
Intermittent malaria	89
Remittent malaria	192
Acute diarrhea	255
Typhoid fever	21
Undetermined fever	1
Other diseases	17
Total	575

This regiment left Chickamauga Park, Ga., August 24, and proceeded to Camp Hamilton, near Lexington, Ky.

The September report also is without comment.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,254
Intermittent malaria	97
Remittent malaria	159
Acute diarrhea	86
Typhoid fever	6
Other diseases	99
Total	447

Early in September this regiment left Lexington, Ky., and proceeded to Leavenworth, Kans., where the men were furloughed. There is a report for October, but evidently it applies to only a detail. This report consists of 12 cases. Two of these are of interest to us. The surgeon-major was taken with typhoid fever September 26, and was able to return to duty November 9. One of the captains was taken sick October 9 with a disease diagnosed "remittent malaria," and returned to duty October 30.

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

- No. 1. Company H: Typhoid fever, May 21; disposition not given.
- No. 2. Company H: Typhoid fever, May 21 to July 7.
- No. 3. Company K: Typhoid fever, June 1; sent to division hospital without date; further disposition not given.
- No. 4. Company B: Diarrhea, June 2 to 20.
- No. 5. Company I: Biliousness, June 4 to 19.
- No. 6. Company I: Typhoid fever, June 4; died in division hospital July 3.
- No. 7. Company M: Diarrhea, June 6 to 20.
- No. 8. Company M: Diarrhea, June 6 to 27.
- No. 9. Company B: Diarrhea, June 8 to 24.
- No. 10. Company H: Typhoid fever, July 1; disposition not given.
- No. 11. Company A: Remittent malaria, July 1; sent to division hospital July 20; further disposition not given.
- No. 12. Company I: Typhoid fever, July 1; furloughed from Leiter Hospital August 13.
- No. 13. Company D: Remittent fever, July 1; sent to division hospital July 20; further disposition not given.
- No. 14. Company H: Remittent malaria, July 1; still sick in quarters July 31.
- No. 15. Company B: Remittent malaria, July 1; sent to division hospital July 19; further disposition not given.
- No. 16. Remittent malaria, July 1; still sick in division hospital July 31.
- No. 17. Company G: Diarrhea, July 1; deserted July 24.
- No. 18. Company E: Typhoid fever, July 1; sent to Fort Thomas without date.
- No. 19. Company B: Malaria, July 3; still sick July 31.
- No. 20. Company D: Diarrhea, July 4; sent to division hospital July 20; further disposition not given.
- No. 21. Company B: Diarrhea, July 5; still sick in quarters July 31.
- No. 22. Company B: Remittent malaria, July 7; still sick in quarters July 31.
- No. 23. Company D: Intermittent malaria, July 7; still sick in quarters July 31.
- No. 24. Company B: Remittent malaria, July 7; still sick in quarters July 31.

No. 25. Company G: Remittent malaria, July 7; furloughed from Leiter Hospital August 12. In hospital this case was diagnosed typhoid fever.

No. 26. Company E: Diarrhea, July 8; still sick in quarters July 31.

No. 27. Company A: Typhoid fever, July 8; sent to division hospital July 24; further disposition not given.

No. 28. Company C: Remittent malaria, July 10; still sick in quarters July 31.

No. 29. Company A: Typhoid fever, July 11; sent to division hospital July 17 and furloughed August 30.

No. 30. Company B: Typhoid fever, July 11; disposition not given.

No. 31. Company A: Malaria, July 11; sent to division hospital July 31; further disposition not given.

No. 32. Band: Typhoid fever, July 12; furloughed August 20.

No. 33. Company C: Malaria, July 14; still sick August 31.

No. 34. Company A: Typhoid fever, July 14; furloughed from Leiter Hospital August 31.

No. 35. Company B: Diarrhea, July 14; still sick in quarters July 31.

No. 36. Company B: Typhoid fever, July 16; still sick in quarters July 31.

No. 37. Company G: Malaria, July 16; still sick in quarters July 31.

No. 38. Company I: Malaria, July 17; still sick in quarters July 31.

No. 39. Company L: Malaria, July 17; still sick in quarters July 31.

No. 40. Company not given: Typhoid fever, July 17; still sick in quarters July 31.

No. 41. Company I: Malaria, July 18; sent to division hospital without date; further information not given.

No. 42. Company B: Malaria, July 18; still sick in quarters July 31.

No. 43. Company H: Typhoid fever, July 19; died in Leiter Hospital July 19.

No. 44. Company C: Typhoid fever, July 19; furloughed from Leiter Hospital August 10.

No. 45. Company B: Typhoid fever, July 19; died in Leiter Hospital July 22.

No. 46. Company L: Typhoid fever, July 19; furloughed from Leiter Hospital August 28.

No. 47. Company M: Typhoid fever, July 19; furloughed from Leiter Hospital August 10.

No. 48. Company B: Malaria, July 20; still sick in quarters July 31.

No. 49. Company C: Malaria, July 21; still sick in quarters July 31.

No. 50. Company K: Typhoid fever, July 22; furloughed from Leiter Hospital August 16.

No. 51. Company D: Typhoid fever, July 24; furloughed from Leiter Hospital August 28.

No. 52. Company B: Typhoid fever, July 25; disposition not given.

No. 53. Company K: Typhoid fever, July 27; disposition not given.

No. 54. Company B: Typhoid fever, July 30; disposition not given.

No. 55. Company H: Remittent malaria, August 1; still sick in division hospital August 31.

No. 56. Hospital Corps: Remittent malaria, August 2 to 16.

No. 57. Company D: Remittent malaria, August 2; still sick in division hospital August 31.

No. 58. Company E: Typhoid fever, August 2; died August 17.

No. 59. Company I: Typhoid fever, August 2; still sick in division hospital August 31.

No. 60. Company G: Remittent malaria, August 2 to 17.

No. 61. Company I: Diarrhea, August 2; still sick in division hospital August 31. In hospital this man is recorded as having typhoid fever.

No. 62. Company G: Remittent malaria, August 2; furloughed from division hospital August 17. In hospital this case was diagnosed typhoid fever.

No. 63. Company D: Remittent malaria, August 2; furloughed from division hospital August 29. In hospital this case was diagnosed continued malaria.

No. 64. Company F: Remittent malaria, August 3; furloughed August 19.

No. 65. Company K: Remittent malaria, August 3 to 18.

No. 66. Company D: Remittent malaria, August 3; furloughed from division hospital August 31. In hospital this case was diagnosed typhoid fever.

No. 67. Company C: Remittent malaria, August 3; furloughed August 26.

No. 68. Company K: Remittent malaria, August 4; still sick in division hospital August 31.

No. 69. Company A: Typhoid fever, August 4; furloughed August 22.

No. 70. Company D: Remittent malaria, August 4; still sick in division hospital August 31.

No. 71. Company F: Typhoid fever, August 4; furloughed without date.

No. 72. Company G: Typhoid fever, August 5; sent to division hospital August 17; further disposition not given.

No. 73. Company D: Typhoid fever, August 5; furloughed from division hospital September 13.

No. 74. Company F: Remittent malaria, August 5; furloughed August 19.

No. 75. Company D: Typhoid fever, August 7; furloughed from Leiter Hospital August 31.

No. 76. Company F: Typhoid fever, August 7; furloughed without date.

No. 77. Company D: Typhoid fever, August 7; furloughed from division hospital August 29.

No. 78. Company H: Typhoid fever August 7; furloughed from division hospital October 3.

No. 79. Company H: Remittent malaria, August 8; sick in division hospital August 31.

No. 80. Company I: Intermittent malaria, August 8; still sick in division hospital August 31.

No. 81. Company A: Typhoid fever, August 8; still sick in Sternberg Hospital August 31.

No. 82. Company F: Remittent malaria, August 9 to 29.

No. 83. Company E: Remittent malaria, August 9; furloughed from division hospital September 14. In hospital this case was diagnosed typhoid fever.

No. 84. Company G: Malaria, August 11; furloughed from division hospital September 14. In hospital this case was diagnosed typhoid fever.

No. 85. Company L: Remittent malaria, August 12; furloughed from Sternberg Hospital September 3. In hospital this case was diagnosed typhoid fever.

No. 86. Company G: Remittent malaria, August 12 to 30.

No. 87. Company K: Typhoid fever, August 12; furloughed from division hospital August 29.

No. 88. Company M: Typhoid fever, August 12; furloughed from division hospital August 29.

No. 89. Company M: Remittent malaria, August 13; furloughed from division hospital September 28.

No. 90. Company A: Typhoid fever, August 13; sent to division hospital without date; further information not given.

No. 91. Company I: Remittent malaria, August 13; still sick in division hospital August 31.

No. 92. Company E: Remittent malaria, August 14; still sick in division hospital August 31.

No. 93. Company E: Remittent malaria, August 14; still sick in hospital September 23.

No. 94. Company B: Remittent malaria, August 14; furloughed from division hospital September 5. In hospital this case was diagnosed typhoid fever.

No. 95. Company B: Remittent malaria, August 15; still sick in division hospital August 31.

No. 96. Company B: Typhoid fever, August 15; died. Date of death is not given.

No. 97. Company B: Remittent malaria, August 15; still sick in division hospital August 31.

No. 98. Company M: Remittent malaria, August 15; furloughed from division hospital August 29. In hospital this case was diagnosed typhoid fever.

No. 99. Company M: Remittent malaria, August 15; furloughed without date.

No. 100. Company L: Typhoid fever, August 16; furloughed from division hospital August 31.

No. 101. Company H: Typhoid fever, August 16; furloughed from division hospital August 29.

No. 102. Company C: Remittent malaria, August 16; furloughed from Sternberg Hospital August 23.

No. 103. Company L: Remittent malaria, August 16; still sick in division hospital August 31.

No. 104. Company K: Typhoid fever, August 16; still sick in division hospital August 31.

No. 105. Company G: Remittent malaria, August 16; still sick in division hospital August 31.

No. 106. Company I: Typhoid fever, August 16; furloughed from division hospital August 29.

No. 107. Company K: Diarrhea, August 16; still sick in division hospital August 31.

No. 108. Company L: Remittent malaria, August 17; furloughed without date.

No. 109. Company I: Remittent malaria, August 17; furloughed August 30.

No. 110. Company D: Remittent malaria, August 17 to September 12.

No. 111. Company G: Remittent malaria, August 17; still sick in division hospital August 31.

No. 112. Company D: Indigestion, August 17; furloughed from Sternberg Hospital October 23. In hospital this case was diagnosed typhoid fever.

No. 113. Company B: Typhoid fever, August 17; furloughed from division hospital September 12.

No. 114. Company G: Remittent malaria, August 17; furloughed from Sternberg Hospital September 26. In hospital this case was diagnosed typhoid fever.

No. 115. Company B: Typhoid fever, August 17; died. Date of death is not given.

No. 116. Company K: Remittent malaria, August 17; furloughed from division hospital September 14. In hospital this case was diagnosed typhoid fever.

No. 117. Company G: Remittent malaria, August 17; furloughed without date.

No. 118. Company B: Remittent malaria, August 17; furloughed without date.

No. 119. Company B: Remittent malaria, August 18 to September 4.

No. 120. Company D: Remittent malaria, August 18 to September 1.

No. 121. Company G: Remittent malaria, August 18; died in division hospital September 5. In hospital this case was diagnosed typhoid fever.

No. 122. Company H: Remittent malaria, August 18; furloughed without date.

No. 123. Company A: Typhoid fever, August 18; disposition not given.

No. 124. Company F: Remittent malaria, August 18; furloughed without date.

No. 125. Company G: Remittent malaria, August 18; furloughed from division hospital September 14. In hospital this case was diagnosed typhoid fever.

No. 126. Company L: Remittent malaria, August 19; still sick in division hospital August 31.

No. 127. Company E: Typhoid fever, August 19; furloughed from Sternberg Hospital September 30.

No. 128. Company A: Typhoid fever, August 19; furloughed from Sternberg Hospital September 8.

No. 129. Company D: Continued malaria, August 19; furloughed from Leiter Hospital September 10.

No. 130. Company L: Remittent malaria, August 19; furloughed from division hospital September 14. In hospital this case was diagnosed typhoid fever.

No. 131. Company A: Typhoid fever, August 19; furloughed from Sternberg Hospital August 26.

No. 132. Company G: Remittent malaria, August 20; furloughed August 27.

No. 133. Company C: Remittent malaria, August 20; furloughed August 30.

No. 134. Company G: Intermittent malaria, August 20; furloughed August 31.

No. 135. Company L: Remittent malaria, August 20; furloughed August 28.

No. 136. Company G: Typhoid fever, August 20; furloughed September 14.

No. 137. Company D: Remittent malaria, August 20 to September 15.

No. 138. Company B: Remittent malaria, August 20; furloughed without date.

No. 139. Company E: Remittent malaria, August 20; furloughed August 27.

No. 140. Company L: Remittent malaria, August 20; furloughed without date.

No. 141. Company G: Remittent malaria, August 20; furloughed August 31.

No. 142. Company A: Remittent malaria, August 20; furloughed from division hospital September 20. In hospital this case was diagnosed typhoid fever.

No. 143. Company B: Remittent malaria, August 20 to September 15.

No. 144. Company D: Remittent malaria, August 20; furloughed August 30.

No. 145. Company A: Remittent malaria, August 20; furloughed August 29.

No. 146. Company C: Remittent malaria, August 21; still sick in division hospital August 31.

No. 147. Company D: Remittent malaria, August 21; furloughed August 28.

No. 148. Company C: Remittent malaria, August 21; still sick in division hospital August 31.

No. 149. Company E: Remittent malaria, August 22; furloughed August 29.

No. 150. Company E: Typhoid fever, August 23; died September 10.

No. 151. Company L: Typhoid fever, August 23; furloughed September 18.

No. 152. Company K: Typhoid fever, August 23; furloughed from division hospital September 14.

No. 153. Company C: Typhoid fever, August 23; furloughed from division hospital August 31.

No. 154. Company F: Typhoid fever, August 25; still sick September 30.

No. 155. Company I: Remittent malaria, August 25; furloughed September 27.

No. 156. Company E: Remittent malaria, August 25; still sick September 30.

No. 157. Company C: Remittent malaria, August 26; still sick September 30.

No. 158. Company not given. Typhoid fever, August 26; furloughed from division hospital October 28.

No. 159. Company B: Remittent malaria, August 27; still sick September 30.

No. 160. Company B: Remittent malaria, August 27; still sick September 30.

No. 161. Company H: Typhoid fever, August 27; died September 19.

No. 162. Company E: Remittent malaria, August 27; furloughed September 1.

No. 163. Company D: Remittent malaria, August 27 to September 16.

No. 164. Company E: Typhoid fever, August 27; disposition not given.

No. 165. Band: Remittent malaria, August 27; furloughed September 1.

No. 166. Company H: Typhoid fever, August 28; disposition not given.

No. 167. Company A: Remittent malaria, August 29; still sick September 19.

No. 168. Company A: Diarrhea, August 30 to September 16.

No. 169. Company B: Remittent malaria, August 31; still sick in quarters September 17.

No. 170. Band: Typhoid fever, August 31; disposition not given.

No. 171. Band: Typhoid fever, August 31; furloughed from division hospital September 3.

No. 172. Company C: Typhoid fever, August 31; furloughed September 26.

No. 173. Company H: Typhoid fever, August 31; furloughed September 26.

No. 174. Company I: Typhoid fever, August 31; sick in quarters September 17.

No. 175. Company L: Typhoid fever, August 31; furloughed October 9.

No. 176. Company G: Remittent malaria, September 1; still sick in hospital September 30.

No. 177. Company M: Remittent malaria, September 1; furloughed from division hospital September 28.

No. 178. Company B: Typhoid fever, September 1; died in hospital September 14.

No. 179. Company F: Remittent malaria, September 1; still sick in division hospital September 30.

No. 180. Company E: Remittent malaria, September 1; still sick in division hospital September 30.

No. 181. Company M: Remittent malaria, September 1; still sick in hospital September 30.

No. 182. Company D: Remittent malaria, September 1; still sick in division hospital September 30.

No. 183. Company I: Typhoid fever, September 1; disposition not given.

No. 184. Company K: Remittent malaria, September 1; still sick September 30.

No. 185. Company not given. Remittent malaria, September 2; still sick in division hospital September 30.

No. 186. Indigestion, September 2 to 25.

No. 187. Company D: Remittent malaria, September 2; still sick in division hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 188. Company K: Remittent malaria, September 2; still sick in division hospital September 30.

No. 189. Company I: Diarrhea, September 2; still sick in division hospital September 30.

No. 190. Company H: Remittent malaria, September 3; still sick September 30.

No. 191. Company K: Remittent malaria, September 3; still sick in division hospital September 30.

No. 192. Company F: Remittent malaria, September 3; still sick in division hospital September 30.

No. 193. Company C: Remittent malaria, September 3; still sick in division hospital September 30.

No. 194. Company G: Remittent malaria, September 3; still sick in division hospital September 30.

No. 195. Company F: Typhoid fever, September 3; furloughed from division hospital October 12.

No. 196. Company D: Remittent malaria, September 4; still sick in division hospital September 30.

No. 197. Company K: Remittent malaria, September 4; still sick September 30.

No. 198. Company M: Remittent malaria, September 4; still sick September 30.

No. 199. Band: Remittent malaria, September 5 to October 10.

No. 200. Band: Remittent malaria, September 5; still sick September 30.

No. 201. Company K: Remittent malaria, September 5; still sick September 30.

No. 202. Company F: Remittent malaria, September 5; still sick September 30.

No. 203. Company A: Indigestion, September 6; still sick September 30.

No. 204. Company A: Remittent malaria, September 6; still sick September 30.

No. 205. Company H: Remittent malaria, September 6; still sick September 30.

No. 206. Company M: Remittent malaria, September 6; still sick September 30.

No. 207. Company C: Remittent malaria, September 6; still sick in quarters September 30.

No. 208. Company M: Remittent malaria, September 6; still sick in hospital September 30.

No. 209. Company L: Remittent malaria, September 6; still sick September 30.

No. 210. Company M: Remittent malaria, September 6; still sick in hospital September 30.

No. 211. Company L: Remittent malaria, September 6; still sick in hospital September 30.

No. 212. Company E: Remittent malaria, September 6; still sick in quarters September 18.

No. 213. Company F: Diarrhea, September 6; still sick in quarters September 30.

No. 214. Company E: Remittent malaria, September 7; still sick in hospital September 30.

No. 215. Company K: Remittent malaria, September 7; still sick in hospital September 30.

No. 216. Company I: Remittent malaria, September 7; still sick at Fort Thomas September 30. In hospital this case was diagnosed typhoid fever.

No. 217. Company I: Remittent malaria, September 7; furloughed September 27.

No. 218. Company L: Remittent malaria, September 8; still sick in hospital September 30.

No. 219. Company L: Remittent malaria, September 9; still sick in hospital September 30.

No. 220. Company E: Remittent malaria, September 9; still sick in hospital September 30.

No. 221. Company C: Remittent malaria, September 9; still sick in hospital September 30.

No. 222. Company M: Remittent malaria, September 9; still sick in hospital September 30.

No. 223. Company F: Remittent malaria, September 10; furloughed September 26.

No. 224. Company I: Remittent malaria, September 10; still sick in hospital September 30.

No. 225. Company not given: Remittent malaria, September 10; still sick in hospital September 30.

No. 226. Company L: Remittent malaria, September 10; still sick on furlough September 30.

No. 227. Company L: Remittent malaria, September 10; still sick in hospital September 30.

No. 228. Company M: Remittent malaria, September 10; still sick in hospital September 30.

No. 229. Company D: Intermittent malaria, September 11; still sick in quarters September 26.

No. 230. Company D: Remittent malaria, September 11; still sick in hospital September 30.

No. 231. Company E: Remittent malaria, September 11; still sick in hospital September 30.

No. 232. Company B: Remittent malaria, September 11; still sick in hospital September 30.

No. 233. Company G: Typhoid fever, September 11; still sick in quarters October 15.

No. 234. Company I: Remittent malaria, September 11; still sick in quarters October 17.

No. 235. Company F: Remittent malaria, September 12; still sick in hospital September 30.

No. 236. Company E: Remittent malaria, September 13; still sick in hospital September 30.

No. 237. Company G: Remittent malaria, September 13; still sick in hospital September 30.

No. 238. Company M: Remittent malaria, September 13; furloughed from hospital September 26.

No. 239. Company I: Remittent malaria, September 13; still sick in hospital September 30.

No. 240. Company A: Remittent malaria, September 13; still sick in hospital September 30.

No. 241. Company K: Remittent malaria, September 13; still sick in hospital September 30.

No. 242. Company F: Remittent malaria, September 13; still sick in hospital September 30.

No. 243. Company A: Remittent malaria, September 14; still sick September 30.

No. 244. Company I: Remittent malaria, September 14; still sick in hospital September 30.

No. 245. Company H: Remittent malaria, September 15; still sick in hospital September 30.

No. 246. Company H: Remittent malaria, September 15; still sick in hospital September 30.

No. 247. Company M: Remittent malaria, September 15; still sick in quarters September 29.

No. 248. Company F: Remittent malaria, September 15; still sick in hospital September 30.

No. 249. Company K: Remittent malaria, September 15; still sick in hospital September 30.

No. 250. Company G: Remittent malaria, September 16; still sick in division hospital September 30.

No. 251. Company not given: Typhoid fever, September 16; disposition not given.

No. 252. Company K: Remittent malaria, September 16; still sick in division hospital September 30.

No. 253. Company C: Remittent malaria, September 16; still sick in division hospital September 30.

No. 254. Company G: Remittent malaria, September 17; still sick in division hospital September 30.

No. 255. Company C: Remittent malaria, September 17; still sick in division hospital September 30.

No. 256. Company K: Remittent malaria, September 17; still sick in division hospital September 30.

No. 257. Company F: Remittent malaria, September 17; still sick in division hospital September 30.

No. 258. Company I: Remittent malaria, September 17; still sick in division hospital September 30.

No. 259. Hospital corps: Typhoid fever, September 17; disposition not given.

No. 260. Company C: Remittent malaria, September 17; still sick in division hospital September 30.

No. 261. Company H: Remittent malaria, September 17; still sick in division hospital September 30.

No. 262. Company L: Remittent malaria, September 18; still sick in division hospital September 30.

No. 263. Company I: Remittent malaria, September 18; still sick in division hospital September 30.

No. 264. Company E: Remittent malaria, September 18; still sick in division hospital September 30.

No. 265. Company C: Remittent malaria, September 18; still sick in division hospital September 30.

No. 266. Company F: Remittent malaria, September 18; still sick in hospital September 30.

No. 267. Company E: Remittent malaria, September 18; still sick in hospital September 30.

No. 268. Company F: Remittent malaria, September 19; still sick at Fort Thomas September 30. In hospital this case was diagnosed typhoid fever.

No. 269. Company L: Remittent malaria, September 19; still sick in division hospital September 30.

No. 270. Company A: Remittent malaria, September 19; still sick in division hospital September 30.

No. 271. Company H: Typhoid fever, September 19; furloughed from Sternberg Hospital October 18.

No. 272. Company C: Remittent malaria, September 20; furloughed September 28.

No. 273. Company F: Typhoid fever, September 20; furloughed from division hospital November 5.

No. 274. Company G: Remittent malaria, September 20; still sick in division hospital September 30.

No. 275. Company E: Remittent malaria, September 21; still sick in division hospital September 30.

No. 276. Company C: Remittent malaria, September 21; still sick in division hospital September 30.

No. 277. Company I: Remittent malaria, September 22; furloughed September 28.

No. 278. Company C: Remittent malaria, September 23; still sick in division hospital September 30.

No. 279. Company H: Remittent malaria, September 23; sent to division hospital September 28.

No. 280. Company H: Remittent malaria, September 23; furloughed September 28.

No. 281. Company H: Remittent malaria, September 23; furloughed September 28.

No. 282. Company C: Remittent malaria, September 23; sent to division hospital September 28.

No. 283. Company not given: Remittent malaria, September 23 to October 30.

No. 284. Company M: Remittent malaria, September 23; furloughed September 28.

No. 285. Company L: Typhoid fever, September 23; still sick in quarters October 15.

No. 286. Company E: Remittent malaria, September 23; furloughed September 28.

No. 287. Company M: Remittent malaria, September 24; furloughed September 28.

No. 288. Company M: Diarrhea, September 24; furloughed September 28.

No. 289. Company E: Remittent malaria, September 24; sent to division hospital September 28.

No. 290. Company F: Remittent malaria, September 24; sent to division hospital September 28.

No. 291. Staff: Typhoid fever, September 26 to November 9.

No. 292. Company C: Remittent malaria, September 29; sent to division hospital, without date.

No. 293. Staff: Remittent malaria, October 9 to 30.

No. 294. Company E: Typhoid fever, November 5; sent to Fort Thomas November 5; further disposition not known.

SUMMARY.

Assembled at State Fair Grounds, near Topeka, Kans., in April, 1898.

Mustered into United States service May 10, 1898.

Arrived at Chickamauga Park, Ga., May 20, 1898.

Strength on arrival, 1,008.

Date of first case of probable typhoid fever, May 21, 1898.

Date of first case of recognized typhoid fever, May 21, 1898.

Left Chickamauga Park August 24, 1898.

Strength on departure, 1,264.

Number of cases of probable typhoid fever developed at Chickamauga 153

Arrived at Lexington, Ky., August 25, 1898.

Number of cases of probable typhoid fever developed after leaving Chickamauga:

From August 25 to 31..... 22

During September..... 117

In October and November..... 2

Total number of cases of probable typhoid fever developed in the Twenty-first Kansas Voluntary Infantry from May to November 294

These 294 cases were diagnosed as follows:

Typhoid fever..... 95

Malaria..... 182

Diarrhea..... 14

Indigestion..... 2

Biliousness..... 1

Total 294

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Adams, Henry.....	Pvt., G.	Aug. 19	Leiter Hospital, Ga....	Typhoid.
Atkinson, Albert R....	Pvt., E.	Sept. 10	Camp Thomas, Ga....	Do.
Bancroft, E. G.....	Corpl., B.	Sept. 14	Camp Hamilton, Ky....	Do.
Beardsley, Stephen A....	Pvt., H.	Sept. 9	....do.....	Do.
Cooper, William L.....	Pvt., K.	Aug. 3	Camp Thomas, Ga....	Do.
Dean, William.....	Pvt., C.	Aug. 2	....do.....	Do.
Digel, Harvey R.....	Pvt., B.	Aug. 12	....do.....	Do.
Dumont, Roy S.....	Pvt., K.	Aug. 22	....do.....	Do.
Eales, Albert B.....	Pvt., E.	Aug. 17	....do.....	Do.
Ellison, Charles F.....	Pvt., B.	July 22	....do.....	Do.
Henry, Adam.....	Pvt., G.	Aug. 25	....do.....	Do.
Herzer, Charles W.....	2d Lt., B.	Aug. 3	Camp Thomas, Ga....	Do.
Hollingsworth, L. J....	Pvt., D.	Sept. 16	Camp Hamilton, Ky....	Do.
Honmer, Theo. A.....	Pvt., A.	July 17	Camp Thomas, Ga....	Do.
McBride, Joseph R.....	Pvt., B.	Aug. 25	....do.....	Do.
Miller, Alvin.....	Sgt., D.	.....	....do.....	Do.
Moore, Lawrence N.....	Corpl., A.	Sept. 1	Chattanooga, Tenn....	Do.
Munger, John.....	Pvt., G.	Sept. 5	Camp Thomas, Ga....	Do.
Payne, Elmer R.....	Corpl., B.	Aug. 25	....do.....	Do.
Root, Chas. H.....	Pvt., I.	July 3	....do.....	Hemiplegia.
Stoner, James B.....	Pvt., I.	Sept. 24	Quinten, Kans.....	Typhoid.
Swanders, James E.....	Pvt., band	July 31	Camp Thomas, Ga....	Do.
Werden, Ralph E.....	Corpl., B.	June 14	....do.....	Measles and meningitis.

This gives a total of 23 deaths, 21 of which were certainly due to typhoid fever.

Percentage of deaths among probable cases (294) of typhoid fever, 7.14.

Percentage of deaths among recognized cases (95) of typhoid fever, 22.10.

COMMUNICATIONS FROM THE SURGEONS OF THE TWENTY-FIRST KANSAS VOLUNTEER INFANTRY.

Medical officers.

Frank Armstrong, major and surgeon, Eldorado, Kans.

Thomas C. Biddle, captain and assistant surgeon, Topeka, Kans.

Frederick W. Turner, captain and assistant surgeon, Marysville, Kans.

Captain Biddle states:

As to the cause of the typhoid-fever epidemic, I think we might use the laconic expression they "drank it." The sinks were exceedingly insanitary. The rock was so near the surface that it

was practically impossible to dig the sinks with the means at hand to a sufficient depth. They were left entirely open, and they had to be filled and new ones dug so frequently that soon large areas about the camp were dug up and occupied by these sinks. No disinfectant of any kind was available. The same condition prevailed throughout the park. The limestone formation was filled with innumerable crevices and small caves, and by digging into many of these crevices and caves surface water could be found, and owing to the insufficient supply the men would, in violation of orders, drink this water, although it was nothing more nor less than the leaching from sinks. The water for our regiment was drawn from springs situated from 3 to 7 miles from the camp. A team could not make more than from two to three trips a day. We did not have sufficient barrels to store the water. At no time did we have more than two barrels to the company. After we had exhausted all efforts to draw additional barrels we tried to buy them with private funds, but found that none were to be purchased. Orders were issued to boil all drinking water, but this was impracticable from want of utensils for boiling and receivers for storing. After several weeks a well was sunk near our camp, and this partially relieved the situation. However, it is doubtful if the wells in the park were not practically sewers for the thousands of sinks located there. The flies also aided in spreading of the disease. I have never seen them so numerous elsewhere. When the men were eating the flies would fairly swarm on their food. The atmosphere was laden with dust both day and night, and it is presumable that many germs of typhoid fever were carried with the dust.

TWELFTH NEW YORK VOLUNTEER INFANTRY.

Second Brigade, Third Division, First Army Corps.

This regiment assembled at the State encampment at Peekskill, N. Y., May 2, and remained there until May 17. On the latter date it started for Chickamauga Park, Ga., at which place it arrived May 20.

The May report is signed by Thomas Chalmers, first lieutenant and assistant surgeon, acting surgeon of the regiment. Lieutenant Chalmers makes the following statement:

Diarrhea has been the most prevalent disease and has in many cases been due to improperly cooked food, many of the company cooks being inexperienced. The water supply has undoubtedly not been of the best and is also accountable for illness to some extent.

CONDENSED SICK REPORT FOR MAY.

Mean strength.....	1,023
Acute diarrhea.....	68
Tertian malaria.....	4
Intestinal colic.....	12
Other diseases.....	62
Total.....	146

The June report is signed by George G. Ward, jr., major and surgeon, who makes the following statement:

The prevailing disease has been diarrhea, due to the changed mode of living and unusual diet and the water. The meals at first were poorly prepared, due to inexperienced cooks, and many cases of illness were undoubtedly due to the irritating nature of the food. Many cases of diarrhea occurred, and all have yielded to diet, especially malted milk, which has been provided by regimental money, and to medication with bismuth, camphor, and opium. All water has been ordered boiled.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1, 238
Acute diarrhea	184
Malaria	10
Intermittent malaria	1
Tertian malaria	1
Intestinal colic	18
Acute indigestion	5
Subacute gastritis	1
Other diseases	227
Total	447

In the July report Major Ward makes the following statement:

This regiment has been in Chickamauga Park during this month, and the unhealthy condition of the soil, due to the fact that the regiment has encamped under trees for such a long period of time, and to infected water supply, has caused the large number of malarial and typhoid fever cases. This regiment should be removed from this locality at once.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1, 299
Acute diarrhea	98
Malaria	64
Intermittent fever	10
Remittent fever	3
Intestinal colic	4
Acute indigestion	3
Enteric fever	1
Chills and fever	1
Typhoid fever	1
Other diseases	22
Total	207

From the remarks made by Major Ward, and quoted above, it certainly would be inferred that a number of cases of typhoid fever appeared in this regiment during the month of July, and yet only one case is recorded in the sick report. This is not the first time that we have observed that a regimental surgeon recognized the presence of typhoid fever in his regiment, but failed to diagnose the disease properly in his reports.

The August report is signed by Capt. T. C. Chalmers, who makes the following statement:

The prevailing diseases during this month were typhoid fever and malarial fever. The command left Chickamauga Park, Ga., on the 23d of August and arrived at Camp Hamilton, Lexington, Ky., on the 24th of August.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1, 297
Acute diarrhea	60
Malaria	2
Intermittent fever	28
Remittent fever	188
Enteric fever	38
Acute indigestion	2
Intestinal colic	1
Other diseases	36
Total	355

The fact that there is again a contradiction between the comments made by the surgeon and his sick report is evident. In his remarks, he states that the prevailing diseases during the month were typhoid fever and malarial fever, and yet typhoid does not occur in his report. In the report he calls this disease enteric fever. Of course enteric and typhoid fever are used by many physicians as synonyms, and we thus interpret the diagnosis of enteric fever in this report.

The September report is also signed by Captain Chalmers, who makes the following statement:

The health and general condition of the men of this regiment are far improved over last month's condition. The prevailing diseases for this month were typhoid fever and malarial fever.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1, 261
Acute diarrhea	56
Remittent fever	159
Intermittent fever	3
Enteric fever	6
Undetermined fever	4
Acute indigestion	13
Intestinal colic	2
Fever and diarrhea	3
Convalescent typhoid	1
Other diseases	39
Total	286

There is no sick report for this regiment for the month of October.

The report for November is signed by Maj. T. C. Chalmers, with the following statement:

The command moved from Camp Hamilton, Lexington, Ky., November 13 and arrived in Camp Gilman, Americus, Ga., on the 15th day of November. The prevailing diseases during this month have been bronchitis and muscular rheumatism. One death occurred during this month, and this was due to suicide. The sanitary condition of this camp is excellent and the health of the command generally improved.

CONDENSED SICK REPORT FOR NOVEMBER.

Mean strength	1, 145
Acute diarrhea	21
Malarial fever	30
Remittent fever	5
Intermittent fever	8
Enteric fever	1
Undetermined fever	6
Acute indigestion	6
Typhoid fever	1
Convalescent typhoid	3
Other diseases	122
Total	203

The following is a list of the recognized and probable typhoid fever cases in this regiment:

- No. 1. Company A: Acute diarrhea, June 6 to 16.
- No. 2. Company M: Acute diarrhea, June 11 to 22.
- No. 3. Company B: Acute diarrhea, June 19 to 29.
- No. 4. Company K: Malarial fever, without date; sent to divi-

sion hospital June 27. There is no record of this man having been returned to duty at any time.

No. 5. Company L: Malarial fever, without date; sent to division hospital June 27; returned to duty August 1.

No. 6. Company F: Malaria, July 2 to 13.

No. 7. Company M: Diarrhea, July 2; still sick in hospital July 31.

No. 8. Company C: Diarrhea, July 2 to 26.

No. 9. Company K: Remittent malaria, July 3; furloughed August 22.

No. 10. Company B: Without date or diagnosis; sent to division hospital July 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 18.

No. 11. Company K: Without date or diagnosis; sent to Leiter Hospital July 3. Here the disease was diagnosed as intermittent malaria, and the patient was furloughed July 18.

No. 12. Company F: Chills and fever, July 4; returned to duty July 30.

No. 13. Company B: Diarrhea, July 4 to August 19.

No. 14. Company B: Acute indigestion, July 5; still sick in hospital July 31.

No. 15. Company B: Diarrhea, July 6 to 28.

No. 16. Company G: Diarrhea, July 7; still sick in hospital July 31.

No. 17. Company B: Remittent malaria, July 9 to 22.

No. 18. Company G: Diarrhea, July 9 to 31.

No. 19. Company G: Diarrhea, July 9; still sick in hospital July 31.

No. 20. Company A: Malaria, July 9; sent to Leiter Hospital July 19. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 20.

No. 21. Company C: Diarrhea, July 10 to 21.

No. 22. Company M: Remittent malaria, July 11; furloughed August 30.

No. 23. Company F: Intermittent malaria, July 12; sent to Leiter Hospital July 19. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 15.

No. 24. Company G: Diarrhea, July 12; still sick in hospital July 31.

No. 25. Company M: Malaria, July 12; sent to Leiter Hospital July 19. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 28.

No. 26. Company B: Malaria, July 13; sick in hospital July 31.

No. 27. Company G: Malaria, July 14; sick in hospital July 31.

No. 28. Company G: Remittent malaria, July 14; furloughed August 4.

No. 29. Company G: Diarrhea, July 14; sick in hospital July 31.

No. 30. Company A: Typhoid fever, July 14; sick in hospital July 31.

No. 31. Company E: Typhoid fever, July 14; furloughed August 22.

No. 32. Company M: Intermittent malaria, July 14; sick in hospital July 31.

No. 33. Company B: Remittent malaria, July 15; still sick at Fort Thomas November 16.

No. 34. Company G: Diarrhea, July 16; sick in hospital July 31.

No. 35. Company K: Diarrhea, July 16; sick in hospital July 31.

No. 36. Company A: Diarrhea, July 16; sick in hospital July 31.

No. 37. Company A: Diarrhea, July 17; sick in hospital July 31.

No. 38. Company L: Diarrhea, July 17; sick in hospital July 31.

No. 39. Company M: Diarrhea, July 17; sick in hospital July 31.

No. 40. Company G: Enteric fever, July 18; duty August 2.

No. 41. Company H: Diarrhea, July 18 to 31.

No. 42. Company F: Diarrhea, July 18; sick in hospital July 31.

No. 43. Company F: Diarrhea, July 19; sent to Leiter Hospital July 24. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 6.

No. 44. Company B: Without date or diagnosis; sent to Leiter Hospital July 19. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 10.

No. 45. Company B: Without date or diagnosis; sent to Leiter Hospital July 19. Here a diagnosis of typhoid fever was made, and the patient was furloughed August 17.

No. 46. Company G: Without date or diagnosis; sent to Leiter Hospital July 19. Here the disease was diagnosed as typhoid fever, and the patient was furloughed August 18.

No. 47. Company M: Without date or diagnosis; sent to Leiter Hospital July 19. Here the disease was diagnosed as typhoid fever, and the patient was furloughed September 9.

No. 48. Company H: Intermittent malaria, July 20; still sick August 31.

No. 49. Company M: Malaria, July 20; still sick August 31.

No. 50. Company B: Enteric fever, July 20; furloughed August 13. This man returned at the expiration of his furlough; still sick, and was again furloughed November 1.

No. 51. Company E: Enteric fever, July 20; furloughed August 22.

No. 52. Company E: Intermittent malaria, July 20; still sick August 31.

No. 53. Company F: Diarrhea, July 21; still sick August 31.

No. 54. Company A: Intermittent malaria, July 21; still sick August 31.

No. 55. Company G: Typhoid fever, July 22; died August 6.

No. 56. Company G: Malaria, July 22; still sick August 31.

No. 57. Company I: Typhoid fever, July 22 to August 22.

No. 58. Company M: Typhoid fever, July 24; returned to duty August 13.

No. 59. Company L: Typhoid fever, July 24 to August 22.

No. 60. Company F: Malaria, July 25; sick in hospital August 31.

No. 61. Company G: Typhoid fever, July 25 to August 22.

No. 62. Company L: Typhoid fever, July 25 to August 11.

No. 63. Company L: Remittent malaria, July 25 to August 18.

No. 64. Company L: Enteric fever, July 26; furloughed August 7.

No. 65. Company K: Remittent malaria, July 26; still sick August 31.

No. 66. Company I: Typhoid fever, July 27 to August 17.

No. 67. Company H: Typhoid fever, July 28 to August 17.

No. 68. Company E: Malaria, July 28; sent to Sternberg Hospital August 16. Here the diagnosis was changed to typhoid fever and the patient was furloughed August 29.

No. 69. Company L: Remittent malaria, July 29 to August 12.

No. 70. Company A: Malaria July 30; furloughed August 10.

No. 71. Company H: Typhoid fever, July 30; died August 15.

No. 72. Company C: Typhoid fever, July 30; sick in hospital August 31.

No. 73. Company G: Typhoid fever, July 30 to August 30.

No. 74. Company A: Remittent malaria, July 31 to August 17.

No. 75. Company G: Remittent malaria, August 1; sick in hospital August 31.

No. 76. Company G: Enteric fever, August 1; sick in hospital August 31.

No. 77. Company M: Diarrhea, August 1 to 14.

No. 78. Company I: Intermittent malaria, August 1 to 22.

No. 79. Company K: Malaria, August 1 to 12.

No. 80. Company H: Remittent malaria, August 2 to 22.

No. 81. Company H: Remittent malaria, August 2 to 12.

No. 82. Company I: Remittent malaria, August 2; still sick October 31.

No. 83. Company G: Remittent malaria August 2; furloughed September 18.

No. 84. Company D: Remittent malaria, August 3; died August 14.

No. 85. Company H: Remittent malaria, August 3; sent to division hospital August 22. Here the disease was diagnosed typhoid fever, and the patient was furloughed, October 27.

No. 86. Company H: Enteric fever, August 3; sick in hospital August 31.

No. 87. Company K: Remittent malaria August 3; furloughed August 14.

No. 88. Company G: Without date or diagnosis; sent to division hospital August 3. Here the disease was diagnosed as remittent malaria, and the patient was furloughed September 9.

No. 89. Company G: Diarrhea, August 3 to 23.

No. 90. Company M: Remittent malaria, August 3 to 25.

No. 91. Company D: Remittent malaria, August 3; sent to Sternberg Hospital August 16. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 7.

No. 92. Company F: Remittent malaria, August 3; sick in hospital August 31.

No. 93. Company G: Diarrhea, August 3; sick in hospital August 31.

No. 94. Company E: Remittent malaria, August 3 to 14.

No. 95. Company L: Remittent malaria, August 3; sick in hospital August 31.

No. 96. Company K: Remittent malaria, August 3; sick in hospital August 31.

No. 97. Company M: Remittent malaria, August 3 to 25.

No. 98. Company E: Remittent malaria, August 3 to 15.

No. 99. Company H: Remittent malaria, August 3; sent to Sternberg Hospital August 19. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 21.

No. 100. Company E: Without date or diagnosis; sent to division hospital August 4. Here the disease was diagnosed as typhoid fever, and the patient was furloughed September 14.

No. 101. Company C: Remittent malaria, August 4; sent to division hospital August 21. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 8.

No. 102. Company F: Remittent malaria, August 4; sick in hospital August 31.

No. 103. Company E: Remittent malaria, August 4; still sick in hospital August 31.

No. 104. Company A: Without date or diagnosis; sent to division hospital August 5. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 29.

No. 105. Company M: Remittent malaria, August 6 to 25.

No. 106. Company I: Diarrhea, August 6 to 16.

No. 107. Company H: Diarrhea, August 6; sent to Sternberg Hospital August 16. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 1.

No. 108. Company A: Remittent malaria, August 7; sent to Sternberg Hospital August 19. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 27.

No. 109. Company I: Remittent malaria, August 7; sent to division hospital August 12. Here the disease was diagnosed as typhoid fever, and the patient was furloughed September 20.

No. 110. Company H: Diarrhea, August 8; sick in hospital August 31.

No. 111. Company H: Diarrhea August 8; sent to division hospital August 10. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 13.

No. 112. Company M: Remittent malaria, August 8; sent to division hospital August 16. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 20.

No. 113. Company C: Remittent malaria, August 8; still sick in hospital August 31.

No. 114. Company H: Remittent malaria, August 8 to 22.

No. 115. Company B: Remittent malaria, August 9; furloughed August 22.

No. 116. Company F: Remittent malaria, August 9; sent to division hospital August 13. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 18.

No. 117. Company E: Enteric fever, August 10; still sick in hospital August 31.

No. 118. Company B: Enteric fever, August 10; still sick in hospital August 31.

No. 119. Company G: Remittent malaria, August 10 to 22.

No. 120. Company B: Typhoid fever, August 10; still sick in Sternberg Hospital September 23.

No. 121. Company B: Remittent malaria, August 11; furloughed August 22.

No. 122. Company E: Remittent malaria, August 11 to 22.

No. 123. Company I: Remittent malaria, August 11; still sick in hospital August 31.

No. 124. Company K: Intermittent malaria, August 11; still sick in hospital August 31.

No. 125. Company L: Malaria, August 11; still sick in hospital August 31.

No. 126. Company D: Remittent malaria, August 11; still sick in hospital August 31.

No. 127. Company H: Remittent malaria, August 11; still sick in hospital August 31.

No. 128. Company L: Remittent malaria, August 12; furloughed August 23.

No. 129. Company I: Remittent malaria, August 12; sent to division hospital August 17. Here the diagnosis was changed to typhoid fever, and the patient was sent to Sternberg Hospital September 23.

No. 130. Company H: Remittent malaria, August 12; sent to Sternberg Hospital August 19. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 17.

No. 131. Company F: Remittent malaria, August 12; still sick in hospital August 31.

No. 132. Company D: Enteric fever, August 13; still sick in hospital August 31.

No. 133. Company F: Without date or diagnosis; sent to division hospital August 13. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 13.

No. 134. Company L: Remittent malaria, August 14; sent to Sternberg Hospital August 19. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 23.

No. 135. Company I: Diarrhea, August 15; still sick in hospital August 31.

No. 136. Company B: Remittent malaria, August 15; still sick in hospital August 31.

No. 137. Company B: Without date or diagnosis; sent to division hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was sent to Sternberg Hospital September 23.

No. 138. Company H: Without date or diagnosis; sent to division hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 20.

No. 139. Company D: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 15.

No. 140. Company H: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 27.

No. 141. Company L: Remittent malaria, August 16; sent to division hospital August 18. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 13.

No. 142. Company B: Remittent malaria, August 16; still sick in hospital August 31.

No. 143. Company G: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 27.

No. 144. Company F: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 13.

No. 168. Company D: Without date or diagnosis; sent to Leiter Hospital August 19. Here the disease was diagnosed malaria, and the patient was furloughed August 27.

No. 191. Company L: Without date or diagnosis; sent to division hospital August 23. Here the disease was diagnosed as typhoid fever, and the patient was furloughed September 13.

No. 192. Company D: Remittent malaria, August 23; still sick September 30.

No. 193. Company E: Without date or diagnosis; sent to division hospital August 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 13.

No. 194. Company C: Enteric fever, August 24; still sick September 30.

No. 195. Company K: Remittent malaria, August 24; still sick September 30.

No. 196. Company B: Without date or diagnosis; sent to division hospital August 24. Here the disease was diagnosed intermittent malaria, and the patient was furloughed September 17.

No. 197. Company D: Typhoid fever, August 24; still sick September 30.

No. 198. Company E: Remittent malaria, August 26; still sick September 30.

No. 199. Company H: Remittent malaria, August 26; still sick September 30.

No. 200. Company G: Remittent malaria, August 26; still sick September 30.

No. 201. Company G: Without date or diagnosis; sent to division hospital August 26. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 30.

No. 202. Company D: Remittent malaria, August 26; still sick September 30.

No. 203. Company F: Without date or diagnosis; sent to division hospital August 26; still sick September 17.

No. 204. Company L: Without date or diagnosis; sent to division hospital August 27. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 27.

No. 205. Company F: Without date or diagnosis; sent to division hospital August 27. Here the disease was diagnosed typhoid fever, and the patient was returned to sick quarters September 27.

No. 206. Company K: Typhoid fever, August 27; furloughed from Sternberg Hospital October 11.

No. 207. Company E: Without date or diagnosis; sent to division hospital August 27. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 18.

No. 208. Company D: Typhoid fever, August 27; still sick September 30.

No. 209. Company B: Without date or diagnosis; sent to division hospital August 27. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 9.

No. 210. Company B: Typhoid fever, August 27; still sick September 30.

No. 211. Company L: Enteric fever, August 28; still sick September 30.

No. 212. Company L: Enteric fever, August 28; still sick September 30.

No. 213. Company E: Remittent malaria, August 28; still sick September 30.

No. 214. Company I: Remittent malaria, August 28; still sick September 30.

No. 215. Company M: Without date or diagnosis; sent to division hospital August 28; still sick September 30.

No. 216. Company E: Enteric fever, August 28; died September 22.

No. 217. Company M: Remittent malaria, August 28; still sick September 30.

No. 218. Company K: Remittent malaria, August 28; still sick in quarters September 13.

No. 219. Company B: Typhoid fever, August 28; still sick September 30.

No. 220. Company M: Remittent malaria, August 28; still sick September 30.

No. 221. Company K: Remittent malaria, August 28; still sick September 30.

No. 222. Company C: Remittent malaria, August 28; sick in quarters September 10.

No. 223. Company I: Without date or diagnosis; sent to division hospital August 28. Here the disease was diagnosed remittent malaria, and the patient remained sick September 30.

No. 224. Company G: Remittent malaria, August 28; still sick in hospital September 29.

No. 225. Company I: Remittent malaria, August 28; still sick September 30.

No. 226. Company E: Remittent malaria, August 28; still sick September 30.

No. 227. Company D: Indigestion, August 29; still sick September 30.

No. 228. Company E: Remittent malaria, August 29; still sick September 19.

No. 229. Company L: Remittent malaria, August 29; sent to division hospital August 29. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 27.

No. 230. Company K: Remittent malaria, August 29; still sick September 30.

No. 231. Company M: Remittent malaria, August 29; sent to division hospital August 29. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 6.

No. 232. Band: Remittent malaria, August 29; still sick September 17.

No. 233. Company L: Without date or diagnosis; sent to division hospital August 29. Here the disease was diagnosed typhoid fever, and the patient was placed on a hospital train September 9.

No. 234. Company A: Remittent malaria, August 29; still sick September 30.

No. 235. Company E: Remittent malaria, August 29; still sick September 17.

No. 236. Company M: Indigestion, August 29; still sick September 30.

No. 237. Company L: Without date or diagnosis; sent to division hospital August 29. Here the disease was diagnosed typhoid fever, and the patient died September 19.

No. 238. Company F: Remittent malaria, August 29; still sick September 30.

No. 239. Company F: Remittent malaria, August 29; sent to division hospital August 29. Here the diagnosis was changed to typhoid fever, and the patient was still sick September 30.

No. 240. Company A: Without date or diagnosis; sent to division hospital August 29. Here the disease was diagnosed remittent malaria, and the patient was still sick September 20.

No. 241. Company H: Intermittent malaria, August 30; still sick September 30.

No. 242. Company K: Without date or diagnosis; sent to division hospital August 30. Here the disease was diagnosed typhoid fever, and the patient died September 7.

No. 243. Company E: Enteric fever, August 30; still sick September 30.

No. 244. Company M: Remittent malaria August 30; still sick September 30.

No. 245. Company E: Without date or diagnosis; sent to division hospital August 30. Here the disease was diagnosed typhoid fever, and the patient died September 9.

No. 246. Company E: Remittent malaria, August 30; furloughed September 17.

No. 247. Company G: Remittent malaria, August 30; still sick September 30.

No. 248. Company F: Remittent malaria, August 30; furloughed September 19.

No. 249. Company D: Intermittent malaria, August 30; still sick September 30.

No. 250. Company E: Remittent malaria, August 30; still sick September 18.

No. 251. Company A: Remittent malaria, August 30; still sick September 30.

No. 252. Company D: Without date or diagnosis; sent to division hospital August 30. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 18.

No. 253. Company D: Remittent malaria, August 30; still sick September 30.

No. 254. Company F: Intermittent malaria, August 31; still sick September 30.

No. 255. Company L: Remittent malaria, August 31; still sick September 12.

No. 256. Company F: Without date or diagnosis; sent to division hospital August 31. Here the disease was diagnosed remittent malaria, and the patient was still sick September 19.

No. 257. Company E: Without date or diagnosis; sent to division hospital September 1. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 18.

No. 258. Company E: Remittent malaria, September 1; still sick September 30.

No. 259. Company E: Remittent malaria, September 1; still sick September 30.

No. 260. Company G: Without date or diagnosis; sent to division hospital September 1. Here the disease was diagnosed remittent malaria, and the patient was still sick September 12.

No. 261. Company K: Without date or diagnosis; sent to division hospital September 1. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 9.

No. 262. Company D: Remittent malaria, September 1; furloughed September 21.

No. 263. Company M: Remittent malaria, September 1; still sick September 30.

No. 264. Company D: Remittent malaria, September 1; still sick September 11.

No. 265. Company F: Remittent malaria, September 1; still sick September 30.

No. 266. Company K: Without date or diagnosis; sent to division hospital September 1. Here the disease was diagnosed intermittent malaria, and the patient was still sick September 17.

No. 267. Company D: Without date or diagnosis; sent to division hospital September 1. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 1.

No. 268. Company I: Without date or diagnosis; sent to division hospital September 1. Here the disease was diagnosed remittent malaria, and the patient was still sick September 13.

No. 269. Company G: Remittent malaria, September 2; furloughed September 26.

No. 270. Company C: Remittent malaria; September 2; still sick September 19.

No. 271. Company F: Remittent malaria, September 2; still sick September 30.

No. 272. Company K: Remittent malaria, September 2; still sick September 30.

No. 273. Company G: Remittent malaria, September 2; still sick September 30.

No. 274. Company B: Remittent malaria, September 2; still sick September 30.

No. 275. Company C: Remittent malaria, September 2; sent to division hospital September 2. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 11.

No. 276. Company I: Remittent malaria, September 2; still sick September 30.

No. 277. Company L: Remittent malaria, September 2; still sick September 30.

No. 278. Company D: Remittent malaria, September 2; still sick September 30.

No. 279. Company L: Remittent malaria, September 2; still sick September 30.

No. 280. Company B: Remittent malaria, September 3; still sick September 11.

No. 281. Company E: Remittent malaria, September 3; still sick September 30.

No. 282. Company G: Remittent malaria, September 3; still sick October 18.

No. 283. Company H: Remittent malaria, September 3; still sick September 30.

No. 284. Company L: Remittent malaria, September 3; still sick September 30.

No. 285. Company C: Remittent malaria, September 3; furloughed October 3.

No. 286. Company K: Remittent malaria, September 3; still sick September 30.

No. 287. Company F: Remittent malaria, September 3; still sick September 30.

No. 288. Company F: Remittent malaria, September 3; still sick September 30.

No. 289. Company B: Remittent malaria, September 3; still sick September 17.

No. 290. Company G: Diarrhea, September 3; still sick September 30.

No. 291. Company not given. Without date or diagnosis; sent to division hospital September 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 18.

No. 292. Company L: Remittent malaria, September 3; still sick September 22.

No. 293. Company A: Diarrhea and fever September 3; still sick September 30.

No. 294. Company A: Without date or diagnosis; sent to division hospital September 3. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 295. Company C: Remittent malaria, September 3; still sick September 14.

No. 296. Company D: Remittent malaria, September 3; still sick September 30.

No. 297. Company E: Without date or diagnosis; sent to division hospital September 3. Here the disease was diagnosed typhoid fever, and the patient was transferred to Fort Thomas November 2.

No. 298. Company A: Without date or diagnosis; sent to division hospital September 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 12.

No. 299. Company G: Diarrhea, September 3; still sick September 30.

No. 300. Company F: Remittent malaria, September 4 to 24.

No. 301. Company G: Remittent malaria, September 4; still sick September 30.

No. 302. Company L: Without date or diagnosis; sent to division hospital September 4. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 27.

No. 303. Company F: Remittent malaria, September 4; still sick September 30.

No. 304. Company M: Remittent malaria, September 4; still sick September 17.

No. 305. Company E: Diarrhea, September 5; still sick September 30.

No. 306. Company L: Typhoid fever, September 5; furloughed September 19.

No. 307. Company F: Diarrhea, September 5; sent to division hospital September 6. Here the diagnosis was changed to remittent malaria, and the patient was furloughed October 5.

No. 308. Company F: Remittent malaria, September 5; still sick October 14.

No. 309. Company D: Diarrhea and fever, September 5; still sick September 30.

No. 310. Company H: Remittent malaria, September 6; still sick September 17.

No. 311. Company I: Remittent malaria, September 6; still sick September 30.

No. 312. Company A: Diarrhea and fever, September 6; still sick September 30.

No. 313. Company F: Remittent malaria, September 6; still sick September 30.

No. 314. Company K: Diarrhea, September 6; still sick September 30.

No. 315. Company B: Remittent malaria, September 6; sent to division hospital September 6. Here the diagnosis was changed to typhoid fever, and the patient was transferred to Fort Thomas November 5.

No. 316. Company F: Remittent malaria, September 6; still sick September 30.

No. 317. Company B: Diarrhea, September 6; sent to division hospital September 6. Here the diagnosis was changed to remittent malaria, and the patient was still sick September 27.

No. 318. Company C: Remittent malaria, September 6; still sick September 30.

No. 319. Company M: Remittent malaria, September 6; still sick September 30.

No. 320. Company D: Without date or diagnosis; sent to division hospital September 6. Here the disease was diagnosed typhoid fever, and the patient died September 26.

No. 321. Company E: Remittent malaria, September 6; still sick September 30.

No. 322. Company A: Without date or diagnosis; sent to division hospital September 6. Here the disease was diagnosed remittent malaria, and the patient was still sick October 5.

No. 323. Company I: Diarrhea, September 7; still sick September 30.

No. 324. Company F: Remittent malaria, September 7; still sick September 30.

No. 325. Company L: Typhoid fever, September 7 to 28.

No. 326. Company A: Remittent malaria, September 8; still sick September 30.

No. 327. Company I: Enteric fever, September 8; died October 8.

No. 328. Company M: Remittent malaria, September 8; furloughed October 9.

No. 329. Company M: Typhoid fever, September 8; still sick September 30.

No. 330. Company B: Remittent malaria, September 8; sent to division hospital September 8. Here the diagnosis was changed to typhoid fever, and the patient was furloughed November 8.

No. 331. Company M: Remittent malaria, September 8; still sick September 30.

No. 332. Company M: Remittent malaria, September 8; still sick September 30.

No. 333. Company M: Remittent malaria, September 8; still sick September 30.

No. 334. Company K: Remittent malaria, September 8; still sick September 30.

No. 335. Company H: Remittent malaria, September 10; still sick September 30.

No. 336. Company L: Remittent malaria, September 10; still sick September 30.

No. 337. Company K: Without date or diagnosis; sent to division hospital September 10. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 5.

No. 338. Company A: Remittent malaria, September 11; still sick September 30.

No. 339. Company I: Remittent malaria, September 11; still sick September 30.

No. 340. Company C: Remittent malaria, September 11; still sick September 30.

No. 341. Company A: Without date or diagnosis; sent to division hospital September 11. Here the disease was diagnosed remittent malaria, and the patient was still sick October 3.

No. 342. Company B: Without date or diagnosis; sent to division hospital September 11. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 343. Company not given: Typhoid fever, September 12; still sick September 30.

No. 344. Company A: Remittent malaria, September 12; still sick September 30.

No. 345. Company E: Remittent malaria, September 12; still sick September 30.

No. 346. Company A: Without date or diagnosis; sent to division hospital September 12. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 347. Company A: Remittent malaria, September 13; still sick September 30.

No. 348. Company E: Typhoid fever, September 13; still sick September 30.

No. 349. Company D: Remittent malaria, September 13; furloughed October 10.

No. 350. Company G: Typhoid fever, September 13; still sick September 30.

No. 351. Company A: Remittent malaria, September 14; sent to division hospital September 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed November 5.

No. 352. Company K: Remittent malaria, September 14; furloughed October 21.

No. 353. Company I: Remittent malaria, September 14; furloughed October 12.

No. 354. Company L: Remittent malaria, September 14; furloughed October 5.

No. 355. Company L: Remittent malaria, September 14; still sick September 30.

No. 356. Company E: Diarrhea, September 14; still sick September 30.

No. 357. Company C: Remittent malaria, September 14; still sick September 30.

No. 358. Company K: Typhoid fever September 16; still sick October 31.

No. 359. Company I: Without date or diagnosis; sent to division hospital September 16. Here the disease was diagnosed as remittent malaria, and the patient was still sick October 8.

No. 360. Company G: Without date or diagnosis; sent to division hospital September 17. Here the disease was diagnosed as remittent malaria, and the patient was still sick October 8.

No. 361. Company L: Remittent malaria, September 18; still sick October 1.

No. 362. Company L: Remittent malaria, September 18; still sick October 31.

No. 363. Company C: Without date or diagnosis; sent to division hospital September 18. Here the disease was diagnosed gastritis, and the patient was still sick October 18.

No. 364. Company I: Without date or diagnosis; sent to Sternberg Hospital September 19. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 8.

No. 365. Company H: Remittent malaria, September 19; still sick October 31.

No. 366. Company L: Remittent malaria, September 19; still sick October 31.

No. 367. Company D: Remittent malaria, September 19; still sick October 31.

No. 368. Company G: Diarrhea and fever, September 19; furloughed October 9.

No. 369. Company G: Undetermined fever, September 19; still sick October 31.

No. 370. Company A: Remittent malaria, September 19; still sick October 31.

No. 371. Company H: Undetermined fever, September 19; still sick October 31.

No. 372. Company M: Remittent malaria, September 19; sent to division hospital September 20. Here the diagnosis was changed to typhoid fever, and the patient was transferred to Fort Thomas November 5.

No. 373. Company G: Remittent malaria, September 19; still sick October 31.

No. 374. Company M: Remittent malaria, September 19; transferred to Fort Thomas November 5.

No. 375. Company G: Remittent malaria, September 20; still sick October 31.

No. 376. Company C: Remittent malaria, September 20; still sick October 31.

No. 377. Company L: Remittent malaria, September 20; still sick October 31.

No. 378. Company L: Remittent malaria, September 20; furloughed October 18.

No. 379. Company A: Without date or diagnosis; sent to division hospital September 20. Here the disease was diagnosed remittent malaria and the patient was furloughed October 28.

No. 380. Company E: Remittent malaria, September 21; furloughed October 15.

No. 381. Company G: Remittent malaria, September 21; furloughed October 1.

No. 382. Company B: Remittent malaria, September 21; sent to division hospital September 22. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 21.

No. 383. Without Company, date, or diagnosis; sent to division hospital September 21. Here the disease was diagnosed tertian malaria and the patient was furloughed October 28.

No. 384. Company L: Without date or diagnosis; sent to division hospital September 21. Here the disease was diagnosed as dysentery and the patient was furloughed October 9.

No. 385. Without Company, date, or diagnosis; sent to division hospital September 22. Here the disease was diagnosed typhoid fever and the patient was furloughed October 31.

No. 386. Company K: Remittent malaria, September 22; still sick October 23.

No. 387. Company E: Remittent malaria, September 22; sent to division hospital September 22. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 15.

No. 388. Company F: Remittent malaria, September 22; still sick October 31.

No. 389. Company I: Remittent malaria, September 22; still sick October 31.

No. 390. Company F: Without date or diagnosis; sent to division hospital September 22. Here the disease was diagnosed as intermittent malaria, and the patient was furloughed October 28.

No. 391. Company B: Without date or diagnosis; sent to Sternberg Hospital September 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 7.

No. 392. Company B: Remittent malaria, September 23; sent to Sternberg Hospital September 28. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 4.

No. 393. Company I: Without date or diagnosis; sent to Sternberg Hospital September 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 19.

No. 394. Company D: Without date or diagnosis; sent to Sternberg Hospital September 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 7.

No. 395. Company H: Diarrhea, September 24; furloughed November 1.

No. 396. Company H: Diarrhea, September 24; still sick October 31.

No. 397. Company D: Indigestion, September 25; still sick October 31.

No. 398. Company H: Indigestion, September 26; still sick October 31.

No. 399. Company F: Without date or diagnosis; sent to division hospital September 26. Here the disease was diagnosed as remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 400. Company A: Without date or diagnosis; sent to division hospital September 26. Here the disease was diagnosed as remittent malaria, and the patient was still sick October 31.

No. 401. Band: Without date or diagnosis; sent to division hospital September 26. Here the disease was diagnosed as remittent malaria, and the patient was still sick October 8.

No. 402. Company F: Intermittent malaria, September 27; still sick October 31.

No. 403. Company I: Remittent malaria, September 27; still sick October 31.

No. 404. Company F: Diarrhea, September 27; still sick October 31.

No. 405. Company F: Diarrhea, September 27; still sick October 31.

No. 406. Company G: Remittent malaria, September 27; still sick October 31.

No. 407. Company C: Remittent malaria, September 27; still sick October 31.

No. 408. Company I: Remittent malaria, September 27; still sick October 31.

No. 409. Company F: Remittent malaria, September 27; still sick October 31.

No. 410. Company F: Remittent malaria, September 27; transferred to Fort Thomas November 1.

No. 411. Company A: Remittent malaria, September 27; still sick October 31.

No. 412. Company F: Remittent malaria, September 27; still sick October 31.

No. 413. Company E: Indigestion, September 27; still sick October 31.

No. 414. Company F: Remittent malaria, September 27; still sick October 31.

No. 415. Company E: Remittent malaria, September 28; sent to division hospital September 29. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 3.

No. 416. Company E: Remittent malaria, September 28; still sick October 31.

No. 417. Company F: Remittent malaria, September 28; sent to division hospital September 28. Here the diagnosis was changed to typhoid fever and the patient was transferred to Fort Thomas November 16.

No. 418. Company C: Remittent malaria, September 28; still sick October 31.

No. 419. Company K: Remittent malaria, September 28; still sick October 31.

No. 420. Company I: Indigestion, September 28; still sick October 31.

No. 421. Company F: Remittent malaria, September 28; sent to division hospital September 28. Here the diagnosis was changed to typhoid fever and the patient was transferred to Fort Thomas November 16.

No. 422. Company C: Remittent malaria, September 29; still sick October 31.

No. 423. Company F: Remittent malaria, September 29; still sick October 31.

No. 424. Company K: Remittent malaria, September 29; still sick October 31.

No. 425. Company B: Remittent malaria, September 29; still sick October 31.

No. 426. Company C: Remittent malaria, September 29; still sick October 31.

No. 427. Company M: Remittent malaria, September 29; still sick October 31.

No. 428. Company E: Remittent malaria, September 29; still sick October 31.

No. 429. Company F: Without date or diagnosis; sent to division hospital September 29. Here the disease was diagnosed typhoid fever and the patient was transferred to Fort Thomas November 5.

No. 430. Company I: Remittent malaria, September 29; still sick October 31.

No. 431. Company A: Diarrhea and fever, September 29; still sick October 31.

No. 432. Company L: Remittent malaria, September 29; still sick October 31.

No. 433. Company F: Remittent malaria, September 30; sent to division hospital September 30. Here the disease was diagnosed typhoid fever, and the patient was transferred to Fort Thomas November 5.

No. 434. Company K: Diarrhea, September 30; still sick October 31.

No. 435. Company F: Without date or diagnosis; sent to division hospital September 30. Here the disease was diagnosed as intermittent malaria, and the patient was still sick October 12.

No. 436. Company K: Without date or diagnosis; sent to division hospital October 1. Here the disease was diagnosed as remittent malaria, and the patient was furloughed November 2.

No. 437. Company H: Without date or diagnosis; sent to division hospital October 1. Here the disease was diagnosed remittent malaria, and the patient was still sick October 18.

No. 438. Company A: Without date or diagnosis; sent to division hospital October 2. Here the disease was diagnosed typhoid fever, and the patient was still sick October 20.

No. 439. Company A: Without date or diagnosis; sent to division hospital October 2. Here the disease was diagnosed typhoid fever, and the patient was furloughed November 2.

No. 440. Company F: Without date or diagnosis; sent to division hospital October 2. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 15.

No. 441. Company C: Without date or diagnosis; sent to division hospital October 2. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 24.

No. 442. Company C: Without date or diagnosis; sent to division hospital October 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed November 3.

No. 443. Company D: Without date or diagnosis; sent to division hospital October 3. Here the disease was diagnosed remittent malaria, and the patient was still sick October 20.

No. 444. Company D: Without date or diagnosis; sent to division hospital October 3. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 18.

No. 445. Company M: Without date or diagnosis; sent to division hospital October 4. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 27.

No. 446. Company G: Without date or diagnosis; sent to division hospital October 4. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 18.

No. 447. Without company, date, or diagnosis; sent to division hospital October 5. Here the disease was diagnosed remittent malaria, and the patient was furloughed November 2.

No. 448. Company B: Without date or diagnosis; sent to division hospital October 7. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 19.

No. 449. Company I: Without date or diagnosis; sent to division hospital October 8. Here the disease was diagnosed as malarial jaundice, and the patient was still sick October 24.

No. 450. Company I: Without date or diagnosis; sent to division hospital October 8. Here the disease was diagnosed as remittent malaria, and the patient was furloughed October 18.

No. 451. Company H: Without date or diagnosis; sent to division hospital October 10. Here the disease was diagnosed typhoid fever, and the patient transferred to Fort Thomas November 5.

No. 452. Company D: Without date or diagnosis; sent to division hospital October 11. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 28.

No. 453. Company B: Without date or diagnosis; sent to division hospital October 12. Here the disease was diagnosed as remittent malaria, and the patient was furloughed November 1.

No. 454. Company B: Without date or diagnosis; sent to division hospital October 12. Here the disease was diagnosed remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 455. Company K: Without date or diagnosis; sent to division hospital October 12. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 18.

No. 456. Company K: Without date or diagnosis; sent to division hospital October 12. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 28.

No. 457. Company D: Without date or diagnosis; sent to division hospital October 13. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 28.

No. 458. Company A: Without date or diagnosis; sent to division hospital October 13. Here the disease was diagnosed remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 459. Company D: Without date or diagnosis; sent to division hospital October 14. Here the disease was diagnosed typhoid fever, and the patient was transferred to Fort Thomas November 5.

No. 460. Company A: Without date or diagnosis; sent to division hospital October 15. Here the disease was diagnosed remittent malaria, and the patient was transferred to Fort Thomas November 5.

No. 461. Company C: Without date or diagnosis; sent to division hospital October 15. Here the disease was diagnosed remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 462. Company M: Without date or diagnosis; sent to division hospital October 16. Here the disease was diagnosed remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 463. Company G: Without date or diagnosis; sent to division hospital October 16. Here the disease was diagnosed remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 464. Company M: Without date or diagnosis; sent to division hospital October 18. Here the disease was diagnosed typhoid fever, and the patient was transferred to Fort Thomas November 2.

No. 465. Company H: Without date or diagnosis; sent to division hospital October 18. Here the disease was diagnosed as remittent malaria, and the patient was transferred to Fort Thomas November 5.

No. 466. Company K: Without date or diagnosis; sent to division hospital October 18. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 28.

No. 467. Company H: Without date or diagnosis; sent to division hospital October 19. Here the disease was diagnosed as remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 468. Company A: Without date or diagnosis; sent to division hospital October 19. Here the disease was diagnosed remittent malaria, and the patient was furloughed November 1.

No. 469. Company C: Without date or diagnosis; sent to division hospital October 22. Here the disease was diagnosed typhoid fever, and the patient was transferred to Fort Thomas November 2.

No. 470. Company A: Without date or diagnosis; sent to division

hospital October 22. Here the disease was diagnosed remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 471. Without company, date, or diagnosis; sent to division hospital October 23. Here the disease was diagnosed as remittent malaria and the patient had not been returned to duty November 30.

No. 472. Company M: Typhoid fever, October 27 to November 13.

No. 473. Company C: Remittent malaria, October 29 to November 18.

No. 474. Company D: Malaria and gripe, October 30 to November 11.

No. 475. Company D: Malaria, October 30 to November 19.

No. 476. Company G: Typhoid fever, November 4; disposition not given.

No. 477. Company D: Typhoid fever, November 4; disposition not given.

No. 478. Company K: Malaria, November 4 to 19.

No. 479. Company E: Remittent malaria, November 5 to 27.

No. 480. Company G: Malaria, November 5 to 19.

No. 481. Company K: Remittent malaria, November 6 to 19.

No. 482. Company E: Remittent malaria, November 7 to 26.

No. 483. Company A: Malaria, November 8 to 19.

No. 484. Company B: Undetermined fever, November 17; still sick November 30.

No. 485. Company B: Undetermined fever, November 18; still sick November 30.

No. 486. Company C: Undetermined fever, November 21; still sick in brigade hospital November 30.

No. 487. Company A: Undetermined fever, November 21; still sick in brigade hospital November 30.

No. 488. Company L: Malaria, November 23; still sick in brigade hospital November 30.

No. 489. Company D: Malaria, November 24; still sick in brigade hospital November 30.

No. 490. Company B: Malaria, November 26; still sick in brigade hospital November 30.

SUMMARY.

Assembled at Peekskill, N. Y., May 2, 1898.

Mustered into United States service about May 10, 1898.

Arrived at Chickamauga Park, Ga., May 20, 1898.

Strength on arrival, 1,023.

Date of first case of probable typhoid fever, June 6, 1898.

Date of first case of recognized typhoid fever, July 3, 1898.

Left Chickamauga Park August 25, 1898.

Strength at departure, 1,302.

Number of cases of probable typhoid fever developed at Chickamauga..... 197

Arrived at Lexington, Ky., August 26, 1898.

Left Lexington, Ky., November 13, 1898.

Number of cases developed at Lexington, Ky..... 286

Arrived at Americus, Ga., November 13, 1898.

Number of cases of probable typhoid fever developed at Americus, Ga., in November 7

Total number of cases of probable typhoid fever developed in the Twelfth New York Volunteer Infantry from May to November 490

These 490 cases were diagnosed as follows:

Typhoid fever..... 144

Malaria..... 268

Diarrhea..... 47

Chills and fever..... 18

Indigestion..... 13

Total..... 490

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bender, Robert.....	Pvt., I.	1898. Aug. 27	Field Hospital.....	Enteric fever.
Byrne, Edward R....	Corpl., M.	Sept. 12	New York City.....	Typhoid.
Cathie, Albert H....	Pvt., E.	Sept. 2	do.....	Do.
Cook, William H....	Corpl., K.	Sept. 7	Camp Hamilton, Ky..	Do.
Coughlin, Daniel J..	Pvt., H.	Aug. 22	Camp Thomas, Ga....	Do.
Dame, Chas. H.....	Pvt., E.	Sept. 21	Camp Hamilton, Ky..	Do.
Doherty, William....	Corpl., C.	1899. Mar. 9	Hospital ship <i>Missouri</i>	Typhoid, complicated with malarial poisoning.
Doucett, Michael....	Pvt., I.	1898. Oct. 8	Camp Hamilton, Ky..	Typhoid.
Dow, Ralph Henry...	Pvt., H.	July 29	Camp Thomas, Ga....	Do.
Esterhazy, Albert....	Pvt., G.	1899. Jan. 14	Seton Sanitarium, Spuyten Duyvil, N.Y.	No cause given.
Fish, H. Albert.....	Pvt., E.	1898. Sept. 9	Camp Hamilton, Ky..	Typhoid.
Fitzgibbons, Wm. J..	Artl., H.	July 19	Camp Thomas, Ga....	Do.
Heitman, Frank E....	Pvt., G.	Sept. 17	New York City.....	Do.
Hone, Phillips.....	Corpl., H.	Aug. 15	do.....	Do.
Johnson, Andrew....	Pvt., G.	Oct. 9	Camp Hamilton, Ky..	Do.
McQuade, J. L.....	Pvt., L.	Aug. 31	Chickamauga, Ga....	Do.
Martin, Wm. H., jr...	Corpl., G.	Oct. 12	New York Hospital, N.Y.	Do.
Mersereau, Wm.....	Pvt., G.	1899. Mar. 31	Fort Columbus, N. Y..	Do.
Morris, Jas. A.....	Pvt., L.	1898. Sept. 19	Camp Hamilton, Ky..	Do.
Rossmussen, Soren P.	Pvt., D.	Sept. 26	do.....	Do.
Strauss, Wm., jr.....	Corpl., G.	Aug. 6	Fort McPherson.....	Do.

This gives a total of 21 deaths, 20 of which were due to typhoid fever.

Percentage of deaths among probable cases (490) of typhoid fever, 4.08.

Percentage of deaths among recognized cases (144) of typhoid fever, 13.89.

COMMUNICATIONS FROM THE SURGEONS OF THE TWELFTH NEW YORK VOLUNTEER INFANTRY.

Medical officers.

Thomas C. Chalmers, major and surgeon, New York City, N. Y.

Jesse S. de Muth, lieutenant and assistant surgeon, New York City, N. Y.

Thomas C. McCleave, lieutenant and assistant surgeon, Berkeley, Cal.

Major Chalmers states:

It was impossible to make a diagnosis of typhoid fever on account of the short time the patients were under observation, it being the custom to transfer all suspicious cases to the general hospital immediately. Lieutenant de Muth, who was in charge, used the terms "enteric fever" and "typhoid fever" as synonymous. The sick report for October was forwarded by him to the Surgeon-General. I do not agree with you in the probable number of cases of typhoid fever in this regiment. I do not regard chills and fever and indigestion as coming under this head, nor do I think that all cases diagnosed malaria should be credited as probable typhoid fever. After my return to the regiment, October 1, 1898, at Lexington, Ky., where they were encamped, boiled water was used almost entirely by the men of this regiment. The water used at Lexington, Americus, and Matanzas was city water, piped to the camp, boiled and iced. The sinks were thoroughly disinfected, and the floors and sides washed daily with a 1 to 500 solution of bichloride of mercury. In Matanzas the sinks emptied directly into the bay. The sick report grew smaller and smaller each month during our stay in Cuba, and for the whole of that period was less than one-half of 1 per cent.

SECOND MISSOURI VOLUNTEER INFANTRY.**Third Brigade, Third Division, First Army Corps.**

This regiment assembled and was mustered into service at Jefferson Barracks, Mo. It left this place May 18, 1898, and reached Chickamauga Park, Ga., May 20, where it remained until August 27. On the last-mentioned date it was transferred to Lexington, Ky.

Maj. Samuel K. Crawford signed all the reports from May to November, inclusive, with the exception of that for August, which was signed by Asst. Surg. Charles A. Straus.

Inasmuch as there are certain defects in these reports, and as they contain no information of value, we will omit them and will proceed at once to give a list of cases of both recognized and probable typhoid fever, which is as follows:

No. 1. Diarrhea, May 26 to June 10. This was probably a mild case of typhoid fever.

No. 2. Typhoid fever, May 27; still sick July 31. There is no record of this man later than the July report.

No. 3. Diarrhea, June 1; still sick June 30. This name does not occur on any later report.

No. 4. Remittent malaria, June 4 to June 30.

No. 5. Typhoid fever, June 7; no disposition given.

No. 6. Typhoid fever, June 9; died July 1.

No. 7. Typhoid fever, June 18 to July 24.

No. 8. Typhoid fever, June 20 to July 18.

No. 9. Typhoid fever, June 25; died July 11.

No. 10. Typhoid fever, June 26; died July 17.

No. 11. Typhoid fever, June 27; still sick June 30. This name is not found on any subsequent report.

No. 12. Typhoid fever, June 28 to October 16. This man is recorded as having had diarrhea June 7 and June 17, with no record of being returned to duty in either instance.

No. 13. Typhoid fever, June 28; no disposition given.

No. 14. Typhoid fever, June 28; disposition not given.

No. 15. Typhoid fever, June 30; sick in division hospital July 31.

No. 16. Typhoid fever, June 30; furloughed August 23.

No. 17. Typhoid fever, June 30 to July 27.

No. 18. Typhoid fever, July 1; sick in division hospital July 31.

No. 19. Typhoid fever, July 1 to September 18. This man had remittent malaria June 6 and 7.

No. 20. Typhoid fever, July 3 to September 4.

No. 21. Typhoid fever, July 4; died August 23.

No. 22. Typhoid fever, July 6; sick in hospital July 31.

No. 23. Typhoid fever, without date; sent to Fort Thomas July 6; returned to duty July 27.

No. 24. Typhoid fever, July 6; died August 10.

No. 25. Malaria, July 8 to 27. This man had cholera morbus June 3 to 9.

No. 26. Typhoid fever, July 8; sick in hospital July 31.

No. 27. Intermittent malaria, July 8 to 25. This man subsequently had malarial fever from September 9 to 30.

No. 28. Typhoid fever, July 8 to September 10.

No. 29. Typhoid fever, July 8; died September 3.

No. 30. Typhoid fever, July 10; sick in hospital July 31.

No. 31. Typhoid fever, July 11; still sick September 30.

No. 32. Typhoid fever, July 13; furloughed July 29. This man had cholera morbus May 22 to 24.

No. 33. Typhoid fever, July 13; died August 20.

No. 34. Typhoid fever, July 14; sick in division hospital July 31.

No. 35. Typhoid fever, July 14; furloughed September 6.

No. 36. Typhoid fever, July 14; furloughed without date.

No. 37. Typhoid fever, July 14 to September 21. This man had intermittent malaria July 1 to 3.

No. 38. Typhoid fever, July 14 to September 28.

No. 39. Typhoid fever, July 15; furloughed August 23. This man had cholera morbus May 23 and 24; and diarrhea June 2 to 4.

No. 40. Typhoid fever, July 15; sick in hospital July 31.

No. 41. Typhoid fever, July 16; died August 23. This man had diarrhea June 11 and 12.

No. 42. Typhoid fever, July 17; sick in hospital July 31.

No. 43. Typhoid fever, July 17; furloughed August 6.

No. 44. Typhoid fever, July 17 to August 23. This man had intermittent malaria June 5 to 8.

No. 45. Typhoid fever, July 17; furloughed August 6.

No. 46. Typhoid fever, July 19; sick in division hospital July 31. This man had intermittent malaria June 9 and 10.

No. 47. Typhoid fever, July 19; died July 29.

No. 48. Typhoid fever, July 19; sick in division hospital July 31.

No. 49. Typhoid fever, July 21; furloughed August 23.

No. 50. Typhoid fever, July 21; furloughed August 18.

No. 51. Typhoid fever, July 22; furloughed August 23.

No. 52. Typhoid fever, July 22 to September 21. This man had diarrhea June 16 to 18; intermittent malaria July 31; record incomplete.

No. 53. Typhoid fever, July 23 to September 21.

No. 54. Typhoid fever, July 23 to September 30.

No. 55. Typhoid fever, July 23; sick in hospital September 30.

No. 56. Typhoid fever, July 23; furloughed August 23.

No. 57. Typhoid fever, July 23; sick in hospital July 31.

No. 58. Typhoid fever, July 24; furloughed September 14.

No. 59. Typhoid fever, July 24; furloughed September 20.

No. 60. Typhoid fever, July 24. This name does not occur on any of the records after July.

No. 61. Typhoid fever, July 24; disposition not given.

No. 62. Typhoid fever, July 24; died August 6.

No. 63. Typhoid fever, July 25; furloughed August 23.

No. 64. Typhoid fever, July 26 to September 28.

No. 65. Typhoid fever, July 27; furloughed August 23.

No. 66. Typhoid fever, July 29; died September 15.

No. 67. Typhoid fever, July 30; furloughed August 23.

No. 68. Typhoid fever, July 31 to September 28.

No. 69. Typhoid fever, July 31; furloughed August 10.

No. 70. Typhoid fever, August 1; still sick September 30.

No. 71. Typhoid fever, August 2 to September 23. This man had cholera morbus June 7 and 8.

No. 72. Typhoid fever, August 2; furloughed September 18.

No. 73. Typhoid fever, August 2; died September 11.

No. 74. Typhoid fever, August 3 to September 21.

No. 75. Typhoid fever, August 3; furloughed August 31.

No. 76. Typhoid fever, August 3 to September 30.

No. 77. Typhoid fever, August 3 to September 21.

No. 78. Typhoid fever, August 4 to September 21. This man had malaria May 31, with incomplete record; and diarrhea June 4 and 5.

No. 79. Malaria, August 4 to September 21.

No. 80. Typhoid fever, August 4; furloughed August 25.

No. 81. Typhoid fever, August 5; died September 6.

No. 82. Typhoid fever, August 5; sick in hospital August 30.

No. 83. Typhoid fever, August 8; sent to division hospital August 17. There is no further record of this case.

No. 84. Typhoid fever, August 8; sick in hospital September 30. This man had intermittent malaria July 8 to 11.

No. 85. Typhoid fever, August 9; disposition not given.

No. 86. Malaria, August 9 to September 29.

No. 87. Typhoid fever, August 10; furloughed September 18.

No. 88. Typhoid fever, August 10; still sick September 30.

No. 89. Typhoid fever, August 10; furloughed August 23.

- No. 90. Typhoid fever, August 10; furloughed September 11.
 No. 91. Typhoid fever, August 11; still sick September 30.
 No. 92. Typhoid fever, August 11 to September 29.
 No. 93. Typhoid fever, August 11; still sick September 30.
 No. 94. Typhoid fever, August 11; still sick September 30. This man had intermittent malaria June 22 to 26.
 No. 95. Typhoid fever, August 11 to September 21.
 No. 96. Typhoid fever, August 11; sick in hospital September 30.
 No. 97. Typhoid fever, August 11; sick in hospital September 30. This man had diarrhea June 8 to 10.
 No. 98. Typhoid fever, August 12 to September 21.
 No. 99. Typhoid fever, August 12; furloughed September 13.
 No. 100. Typhoid fever, August 12 to September 29. This man had diarrhea June 10 and 11.
 No. 101. Typhoid fever, August 12; sick in hospital September 30.
 No. 102. Typhoid fever, August 12; sick in hospital September 30.
 No. 103. Typhoid fever, August 12; disposition not given.
 No. 104. Typhoid fever, August 12 to September 21.
 No. 105. Malaria, August 13 to September 21.
 No. 106. Typhoid fever, without date; sent to division hospital August 13; died September 20.
 No. 107. Typhoid fever, August 14; disposition not given.
 No. 108. Typhoid fever, August 14; disposition not given. This man had diarrhea June 7 and 8.
 No. 109. Malaria, August 15 to September 20. This man had diarrhea June 17 to 23.
 No. 110. Typhoid fever, August 15; furloughed August 25. This man had intermittent malaria July 12 and 13.
 No. 111. Typhoid fever, August 15; furloughed September 11. This man had diarrhea June 1 to 3.
 No. 112. Typhoid fever, August 15; still sick September 30.
 No. 113. Malaria, August 15 to September 30. This man had diarrhea June 10 and 11.
 No. 114. Typhoid fever, August 15 to September 21. This man had intermittent malaria May 22 and 23; diarrhea, June 14 to 16.
 No. 115. Typhoid fever, August 16; still sick in hospital September 30. This man had intermittent malaria June 22 to 24.
 No. 116. Malaria, August 16 to September 22.
 No. 117. Typhoid fever, without date; sent to Sternberg Hospital August 16; furloughed September 13.
 No. 118. Typhoid fever, August 16; furloughed August 29.
 No. 119. Typhoid fever, without date; sent to Sternberg Hospital August 16; died August 27.
 No. 120. Typhoid fever, August 16; furloughed August 23. This man had diarrhea July 12 to 14.
 No. 121. Typhoid fever, August 16 to September 21.
 No. 122. Typhoid fever, August 16 to September 25.
 No. 123. Typhoid fever, August 17; furloughed September 20.
 No. 124. Typhoid fever, August 17; furloughed August 18.
 No. 125. Typhoid fever, August 17; furloughed August 30.
 No. 126. Typhoid fever, August 18; disposition not given.
 No. 127. Typhoid fever, August 19; disposition not given.
 No. 128. Typhoid fever, August 19; died August 31.
 No. 129. Typhoid fever, August 20; furloughed August 25.
 No. 130. Typhoid fever, August 20 to September 22.
 No. 131. Typhoid fever, August 20 to September 21.
 No. 132. Malaria, without date; sent to division hospital August 20; furloughed August 30.
 No. 133. Typhoid fever, August 20; sick in hospital September 30.
 No. 134. Typhoid fever, August 20 to September 20.
 No. 135. Typhoid fever, August 22; furloughed September 16.
 No. 136. Typhoid fever, August 22; disposition not given.
 No. 137. Malaria, August 22 to September 25.
 No. 138. Typhoid fever, August 23; furloughed September 15.
 No. 139. Typhoid fever, August 23; furloughed August 25. This man had intermittent malaria July 10 and 11.
 No. 140. Typhoid fever, August 23; in hospital September 30. This man had diarrhea June 4 to 7.
 No. 141. Typhoid fever, August 24; furloughed September 13. This man had diarrhea May 22 and 23.
 No. 142. Typhoid fever, August 24; disposition not given. This man had diarrhea June 7 and 8.
 No. 143. Typhoid fever, August 24; sick in hospital September 30.
 No. 144. Typhoid fever, August 24; disposition not given. This man had diarrhea June 4 to 9.
 No. 145. Typhoid fever, August 25; sick in hospital September 30. This man had cholera morbus June 9 and 10.
 No. 146. Typhoid fever, August 26; furloughed September 20.
 No. 147. Typhoid fever, August 26; disposition not given.
 No. 148. Typhoid fever, August 26; furloughed September 20.
 No. 149. Typhoid fever, August 26; still sick in division hospital September 30.
 No. 150. Typhoid fever, August 29; disposition not given.
 No. 151. Typhoid fever, August 29; disposition not given.
 No. 152. Typhoid fever, August 30; disposition not given.
 No. 153. Malaria, August 30; sick in hospital September 30.
 No. 154. Typhoid fever, without date; sent to Sternberg Hospital August 30; furloughed September 16.
 No. 155. Malaria, August 30 to September 20. This man had diarrhea May 22 to 24, and diarrhea May 30 and 31.
 No. 156. Typhoid fever, August 30; sick in hospital September 30.
 No. 157. Typhoid fever, August 31; disposition not given.
 No. 158. Typhoid fever, August 31 to September 21.
 No. 159. Typhoid fever, August 31; sick in division hospital October 31.
 No. 160. Typhoid fever, August 31; furloughed September 6.
 No. 161. Typhoid fever, August 31; disposition not given.
 No. 162. Malaria, without date; sent to hospital September 1; furloughed September 17.
 No. 163. Malaria, September 1; sick in division hospital September 30.
 No. 164. Malaria, September 1 to 28.
 No. 165. Typhoid fever, without date; sent to hospital September 1; sick in quarters October 2.
 No. 166. Malaria, September 1 to October 4.
 No. 167. Typhoid fever, September 1; furloughed September 20.
 No. 168. Malaria, September 1; still sick October 31.
 No. 169. Typhoid fever, September 2; sick in quarters September 28.
 No. 170. Typhoid fever, September 3; sick in division hospital September 30.
 No. 171. Typhoid fever, September 3; sick in hospital September 30.
 No. 172. Typhoid fever, September 3; died September 17.
 No. 173. Typhoid fever, September 4; sick in hospital September 30.
 No. 174. Malaria, September 4 to October 16.
 No. 175. Typhoid fever, September 4; sick in division hospital September 30.
 No. 176. Malaria, September 4; still sick in hospital September 30.
 No. 177. Malaria, September 4; sick in division hospital September 30.
 No. 178. Typhoid fever, September 5; disposition not given.
 No. 179. Typhoid fever, September 5 to 30.
 No. 180. Typhoid fever, September 5 to 29.
 No. 181. Malaria, September 5; sick in division hospital September 30.
 No. 182. Typhoid fever, September 5 to 30.
 No. 183. Malaria, September 5 to 19. This man had cholera morbus June 8 and 9.
 No. 184. Malaria, September 5; sick in hospital September 30.
 No. 185. Typhoid fever, September 6; sick in hospital September 30.
 No. 186. Typhoid fever, without date; sent to hospital September 6; furloughed October 11.

No. 187. Malaria, September 6; sick in hospital September 30.
 No. 188. Malaria, September 8 to 29.
 No. 189. Typhoid fever, September 8; sick in hospital September 30.
 No. 190. Malaria, September 8 to 25.
 No. 191. Malaria, September 8 to 26.
 No. 192. Malaria, September 8 to 20.
 No. 193. Malaria, September 8 to 29.
 No. 194. Malaria, September 8 to 28. This man had diarrhea May 25 to 30.
 No. 195. Malaria, September 8 to 29. This man had diarrhea May 23 and 24; intermittent malaria, September 5 to 7.
 No. 196. Malaria, September 8; sick in hospital September 30.
 No. 197. Malaria, September 8 to 21.
 No. 198. Typhoid fever, September 8 to 25. That this record, giving so many admissions on September 8, is incorrect is proved by this case. It seems that the surgeon entered upon his books cases extending through a week or more past on this date. This individual was in the division hospital as early as August 29.
 No. 199. Typhoid fever September 8; sent to Fort Thomas November 3.
 No. 200. Remittent malaria, September 8; furloughed October 6.
 No. 201. Malaria, September 8 to 29.
 No. 202. Typhoid fever, September 8; furloughed October 6.
 No. 203. Malaria, September 8; sick in hospital September 30. This man had diarrhea June 9 and 10.
 No. 204. Malaria, September 8 to 24. This man had diarrhea September 2 to 4. Undoubtedly the initial date of this typhoid fever should be given as September 2.
 No. 205. Malaria, September 8 to 30. This man had diarrhea July 17 and 18.
 No. 206. Typhoid fever, September 8; disposition not given.
 No. 207. Malaria, September 9; furloughed September 21.
 No. 208. Malaria, September 9; sick in hospital September 30.
 No. 209. Malaria, September 9; sick in hospital September 30.
 No. 210. Malaria, September 9 to 27.
 No. 211. Malaria, September 9; sick in hospital September 30.
 No. 212. Malaria, September 9 to 24. This man had diarrhea June 2 and 3.
 No. 213. Malaria, September 9 to 29. This man had diarrhea May 22 to 24.
 No. 214. Malaria, September 10; sick in hospital October 31.
 No. 215. Typhoid fever, September 10; furloughed October 27.
 No. 216. Malaria, September 10; sick in hospital September 30.
 No. 217. Malaria, September 10 to 30. This man had intermittent malaria July 8 to 10.
 No. 218. Malaria, September 10 to 25.
 No. 219. Malaria, September 10; sick in hospital September 30.
 No. 220. Malaria, September 10 to 27.
 No. 221. Malaria, September 10; sick in hospital September 30.
 No. 222. Malaria, September 10; sick in hospital September 30.
 No. 223. Malaria, September 10; sick in hospital September 30. This man had diarrhea May 30 and 31.
 No. 224. Malaria, September 11; sick in hospital September 30.
 No. 225. Malaria, September 11; sick in hospital September 30. This man had diarrhea June 2 to 4.
 No. 226. Malaria, September 12 to 29. This man had intermittent malaria September 8 to 10, and undoubtedly September 8 should be given as the initial date of his illness.
 No. 227. Malaria, September 12; furloughed October 5.
 No. 228. Malaria, September 12 to 29.
 No. 229. Malaria, September 12 to 26. This man had intermittent malaria September 10 and 11.
 No. 230. Malaria, September 12; still sick October 31.
 No. 231. Malaria, September 12 to 24.
 No. 232. Typhoid fever, September 13; sick in hospital September 30.
 No. 233. Malaria, September 13 to 29.

No. 234. Malaria, September 13 to 27.
 No. 235. Malaria, September 13 to 27. This man had diarrhea June 3 to 5.
 No. 236. Malaria, September 14; sick in hospital September 30.
 No. 237. Malaria, September 14; sick in hospital September 30.
 No. 238. Malaria, September 14 to 29.
 No. 239. Typhoid fever, without date; sent to hospital September 15; furloughed November 3.
 No. 240. Malaria, September 15; sick in hospital September 30.
 No. 241. Malaria, September 16; sick in hospital September 30.
 No. 242. Malaria, September 16; sick in hospital September 30.
 No. 243. Malaria, without date; sent to hospital September 16; furloughed October 8.
 No. 244. Malaria, September 16 to October 5.
 No. 245. Malaria, without date; sent to hospital September 17; returned to sick quarters October 10.
 No. 246. Malaria, September 17 to 30. This man had diarrhea June 7 and 8.
 No. 247. Malaria, September 18 to 30.
 No. 248. Malaria, without date; sent to hospital September 18; sick in quarters October 8.
 No. 249. Typhoid fever, September 19 to October 24.
 No. 250. Typhoid fever, September 21; sent to division hospital September 30; further disposition not given.
 No. 251. Typhoid fever, September 23; disposition not given.
 No. 252. Malaria, without date; sent to hospital September 23; still sick October 31.
 No. 253. Typhoid fever, September 23; sent to division hospital September 30; further disposition is not given.
 No. 254. Malaria, September 25 to October 24.
 No. 255. Typhoid fever, September 25; in division hospital September 30.
 No. 256. Malaria, without date; sent to hospital September 30; furloughed October 18.
 No. 257. Typhoid fever, without date; sent to hospital October 14; still sick October 31.
 No. 258. Typhoid fever, October 14; still sick October 31. This man had intermittent malaria September 9 to 12; diarrhea June 14 to 23.
 No. 259. Malaria, without date; sent to hospital October 14; furloughed November 4.
 No. 260. Typhoid fever October 19; in hospital October 31.
 No. 261. Malaria, without date; sent to hospital October 20; transferred to Fort Thomas November 5.
 No. 262. Malaria, without date; sent to hospital October 22; furloughed November 2.
 No. 263. Typhoid fever, November 2; furloughed November 16.
 No. 264. Typhoid fever, without date; sent to Fort Thomas November 2; returned to duty December 3.
 No. 265. Typhoid fever, without date; sent to Fort Thomas November 5; returned to duty December 3.
 No. 266. Typhoid fever, without date; sent to Fort Thomas November 5; returned to duty November 25.
 No. 267. Malaria, without date; sent to Fort Thomas November 7; returned to duty December 7.
 No. 268. Typhoid fever, without date; sent to hospital November 7; furloughed November 8.

SUMMARY.

Assembled at Jefferson Barracks May 5, 1898.
 Mustered into United States service about May 10, 1898.
 Arrived at Chickamauga Park May 20, 1898.
 Strength on arrival, 1,040.
 Date of first case of probable typhoid fever, May 26, 1898.
 Date of first case of recognized typhoid fever, May 27, 1898.
 Left Chickamauga Park August 27, 1898.
 Strength on departure, 1,269.

Number of cases of probable typhoid fever developed at Chickamauga	149
Arrived at Lexington, Ky., August 29, 1898.	
Number of cases of probable typhoid fever developed after leaving Chickamauga Park:	
From August 28 to 31	12
During September	94
During October	7
During November	6
Total number of cases of probable typhoid fever developed in the Second Missouri Volunteer Infantry from May to November	268
These 268 cases were diagnosed as follows:	
Typhoid fever	181
Malaria	85
Diarrhea	2
Total	268

The following is a list of the total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Barton, Claud	Pvt., L.	Sept. 4	Chickamauga, Ga.	Typhoid.
Brubaker, Erwin E.	Pvt., G.	Sept. 20	Camp Thomas, Ga.	Do.
Concklin, W. W.	Pvt., B.	Aug. 28	.....do	Do.
Cox, James	Pvt., A.	Aug. 23	Division hospital	Do.
Howerton, John M.	Pvt., D.	Aug. 15	Chickamauga, Ga.	Do.
Hughes, Wm. G.	Art., I.	June 26	Camp Thomas, Ga.	Do.
Jordan, Herbert G.	Pvt., I.	Nov. 18	Camp Churchman	Convulsions.
Kuehl, Fred. W.	Pvt., C.	July 26	Camp Thomas, Ga.	Typhoid.
Leshner, Guy	Pvt., L.	Sept. 15	Camp Hamilton, Ky.	Do.
Orrick, James W.	Corpl., E.	Aug. 6	Camp Thomas, Ga.	Do.
Phelps, Wm.	Pvt., M.	Aug. 10	Division hospital	Do.
Quinton, Charles F.	Pvt., D.	July 28	Chickamauga, Ga.	Do.
Shinn, John R.	Pvt., I.	July 1	Place not given	Do.
Smith, Conley L.	Pvt., B.	Sept. 3	Camp Thomas, Ga.	Do.
Stenger, George C.	Pvt., C.	Aug. 11	.....do	Do.
Stultard, Thos.	Pvt., C.	Aug. 23	Division hospital	Do.
Van Geison, Ora.	Pvt., M.	Aug. 31	Chickamauga, Ga.	Do.
Walker, Wm. G.	Pvt., K.	Aug. 20	.....do	Do.
Wood, Chas. P.	Sgt., A.	July 11	.....do	Do.
Worden, John T.	Pvt., E.	July 17	Camp Thomas, Ga.	Do.

This gives a total of 20 deaths, 19 of which were due to typhoid fever.

Percentage of deaths among probable cases (268) of typhoid fever, 7.09.

Percentage of deaths among recognized cases (181) of typhoid fever, 10.49.

COMMUNICATIONS FROM THE SURGEONS OF THE SECOND MISSOURI VOLUNTEER INFANTRY.

Medical Officers.

Samuel K. Crawford, surgeon, Sedalia, Mo.

Charles H. Stearns, assistant surgeon, Clinton, Mo.

H. H. Rutherford, first lieutenant and assistant surgeon, Columbia, Mo.

Major Crawford states:

This regiment went into its first camp immediately south of Jefferson Barracks, Mo., on a high unwooded ridge, having deep soil and perfect drainage, on May 5, 1898, and remained in this camp until May 18, enjoying general good health, having no serious sickness whatever. The water supply was hauled in tanks from the same pipes that furnish water to St. Louis. Here the sinks were dug deep on a side hill to the south of the camp, 300 and 400 feet away, preventing malodors and bad surface influences from affecting the men. No disinfectants were used in the sinks, which were uncovered and open, until date of vacating camp, May 18. Nearly all the men left this camp in good health, despite bad tentage and bad weather. In this camp the men purchased pies and various prepared foods from peddlers, despite orders to the contrary—probable source of infection. May 18 this regiment took trains for and arrived at Camp George H. Thomas, Chickamauga Park, Geor-

gia, May 20, where it went into its second camp on a rocky hill facing the east. The camp site had enough of forest trees to partially shade the grounds, but not enough to prevent drying after rains. Sanitary sinks here were practically impossible, owing to shallow soil and declivity. This camp did not suffer from the drainage of other camps; their slopes gave it immunity from their surface washings.

The Third Brigade sinks of the Third Division, First Army Corps, were all wholly bad; all were shallow, all open, all unprovided with lime or chemicals, and each contributed malodors and flies almost without limit.

By digging new sinks frequently, we tried to minimize exposures to typhoid infection. In this camp the Second Missouri Infantry contracted much sickness, which, apart from attacks of acute indigestion, consisted chiefly of typhoid fever, in its mild, ambulatory form and on to its worst type, attended with cerebro-spinal complications, ulcerations, and perforations of bowels, hemorrhages, and death. The water supply was obtained from the Blue Spring, 4 miles from camp, and was hauled in barrels to many regiments in the park besides the Second Missouri. At first, mule teams were driven into the margin of the spring, and here the barrels were filled and covered with blankets and bits of canvas, which had been thrown on the ground, and thus dirt and infection were freely imparted to the water; besides, in the transfer of this water from the wagons to the company barrels, the men's hands were freely washed in the Blue Spring water. The men drank out of cups in common, dipping them into water barrels in common, and thus the diseased men readily and surely communicated typhoid germs to the uninfected. This method of water supply continued, but under improved conditions during the entire encampment of this regiment in Chickamauga Park, that is, from May 20 until August 27, 1898. Improved methods consisted in keeping mules out of the spring, keeping barrels clean and scalded, forcing the use of individual drinking cups, boiling the drinking water, covering the water barrels and putting faucets in them. From May 20 to August 6 this camp was occupied by the Second Missouri Infantry. No troops had occupied this site since September, 1863, and then only as a battle ground.

On August 6 this regiment was ordered to a new camp, a mile and a half away, which had been the site of other commands a few weeks before. This camp was on better ground, had deep soil, good drainage, was an open field, was easily policed, and of itself apparently sanitary. The Chickamauga Creek ran along the base of this camp, distant half a mile, and all the intervening bottom was heavily wooded, and this low ground received the overflow of many sinks, after heavy rains, from typhoid-fever camps above its level. The prevailing winds blew from this direction and spoiled the air of this, our second Chickamauga camp. The low ground at the base of this camp gave us bad sinks, as they filled up with earth water and by overflow from rains. Here we remained from August 6 until August 27, showing an increase of typhoid fever, especially in an aggravated form, which caused us to furlough nearly 80 of our typhoid convalescents from this and our former camp. While here we purchased, with private funds, lime for the sinks, and thus rendered them relatively less contaminating and offensive.

On the above date we proceeded by rail to our next camp at Lexington, Ky., situated 4 miles east of the city, upon an ideal blue-grass pasture, whose surface was free from timber, was clean and untrodden by the feet of soldiers, having no infection excepting that we brought. Here our sick list decreased, and the cases of typhoid fever that developed became less severe, until the morning sick call failed to bring forth a real Chickamauga tongue, so characteristic of that camp. The supply of water at Lexington was piped from the source of the city supply into barrels at each company kitchen, where it was boiled, placed in barrels with faucets attached, and individual cups were used for drinking. All water barrels were raised on platforms and the utmost care was

taken in police duty. The kitchen sinks were dug deep, covered, and all solid parts of kitchen refuse screened and removed from camp, leaving only the fluids to be held in them.

The sinks and latrines were dug not less than 8 feet deep, covered with neat sheds, supplied with covered seats, and banked outside, thus making the vaults dark as opposed to the breeding of flies and consequent spread of infection. At night, lights were placed in these buildings. Common lime, lime chloride, mercury bichloride, and ferric sulphate were freely used in these vaults, also about the walls and seats, and thus with improved sanitation and change of camp sites typhoid fever was practically stamped out from the Second Missouri Infantry. We added to the above daily routine the exclusion of peddlers' pies and their other food abominations, practiced thorough general policing, and confined the men as near as possible to the Government rations (which are the best on earth), and the men ceased to be victims of typhoid fever and soon became athletes in strength and in action.

In both Chickamauga camps the kitchen refuse was kept in open pits and was covered daily with earth and wood ashes. On November 8 this regiment was removed by rail to Albany, Ga., 700 miles south of Lexington, Ky., and went into Camp Churchman, 1½ miles west of the city. Here sand lies over a red clay, and under these a rotten limestone, containing sea shells and sharks' teeth. All springs in this vicinity are heavily impregnated with lime and are unfit for use in the preparation of food. The water supply was obtained from the city reservoir, which is furnished from an artesian well 800 feet deep. This water was exceptionally pure and cool and was delivered to the regiment through pipes along the line of company kitchens, and to the regimental hospital. In this camp the men's sinks were unusually well constructed, with deep vaults, nice sheds, darkened by banking, seats covered, the entire building kept sanitary through the use of means already mentioned in connection with the camp at Lexington, Ky.

From the time the regiment left the camp at Chickamauga, Ga., the number of cases of typhoid fever diminished and the type grew milder daily. The Chickamauga tongue was never fully reproduced in the Second Missouri Infantry while at Lexington, Ky., and was never seen at sick call or in hospital during the time the regiment remained in its last camp near Albany, Ga. In the brief history of the camp life of this regiment several propositions connected with the propagation and prevention of typhoid fever are clearly demonstrated:

First. That defective sanitation with regard to camp site, camp surroundings, impure water supply, badly prepared food, open and otherwise defective sinks, permitting swarms of flies to deposit germs on protruding and inflamed rectums, defective care of garbage, too long occupation of the same campsite, absence of bathing facilities, access to peddlers' pies, promiscuous use of drinking cups in common, failure to isolate promptly typhoid patients from nontyphoid patients, failure to separate mild typhoid cases from severe typhoid cases, all of which lead to the propagation and rapid spread of this camp disease.

Second. The observance of rules directly and absolutely opposed to the foregoing defects were adopted and rigidly enforced with the result of a steady and rapid reduction of typhoid-fever cases until in the last camp, from November 8, 1898, till March 3, 1899, two or perhaps three cases of typhoid fever would cover the entire number occurring in the camp of the Second Missouri Infantry.

You observed that fewer typhoid cases are reported from the Second Missouri Infantry than are reported from many other commands. If this be so, vigilance over the water supply, care in the preparation of food, treating the sinks to coverings of earth before we had lime, prompt separation of the sick from the well, were prime factors in prevention.

Slight discrepancies between the monthly regimental reports of sick and wounded and those of the division hospitals may appear on account of changes in diagnosis, one surgeon diagnosing certain

cases as malarial remittent fever, while another surgeon regarded them as typhoid cases.

In absence of microscopic tests it was not possible by symptoms and physical signs alone to settle with exactness disputed cases. But with regard to the changes of camps, improved sanitation, the use of pure water, and the separation of typhoid from nontyphoid cases, including the isolation of all the sick from the well, afforded beneficial results that I am assured from personal observation very nearly stamped out typhoid fever from the Second Missouri Infantry.

It is gratifying to notice the decrease in the number of typhoid cases from the breaking up of the first and second camps at Chickamauga until the muster out of this regiment on March 3, 1899, at Albany, Ga., and to those familiar with the physical expressions of patients suffering from the prevailing violent type of this disease, as it developed at Chickamauga, compared with the gradual decline and disappearance of high temperature, red and darkly coated tongues, tender, tympanic bowels, fewer actions of the latter and more comfort between them, fewer hemorrhagic cases, less thirst, more appetite, better rest, better and shorter convalescence, fewer sequelae, suggesting diminished virulence and activity of bacterial agencies, furnishing a parallel of declination on the one hand and on the other increased resistance, due to better sanitation, change of camp site, clean air, and pure water. In absence of strict sanitation, dirt is the greatest possible menace to an army in camp, and the experience gathered at Chickamauga should warn those persons in plenary authority to limit army camps to such numbers as may enable the commands to acquire the necessary evolutions for actual service.

FIRST NEW HAMPSHIRE VOLUNTEER INFANTRY.

Third Brigade, Third Division, First Army Corps.

This regiment was mustered into service May 12, 1898. It reached Chickamauga Park, Ga., May 22.

The first report covers the period from May 12 to May 31, inclusive. In this report Major Burrus makes the following statement:

The prevailing disease has been acute diarrhea, probably caused by drinking surface water. For the first ten days no other water could be obtained. The men had no shovels, and would dig in the runs with sticks for the filthy surface water. We have almost no medical supplies, except those we have bought ourselves in Chattanooga and paid for ourselves. Owing to this, in many cases it has not been possible to properly treat our sick men.

CONDENSED SICK REPORT FROM MAY 12 TO MAY 31, INCLUSIVE.

Mean strength	1,007
Diarrhea	35
Dysentery	49
Acute fever	4
Dyspepsia	5
Enteritis	1
Other diseases	54
Total	148

Two of the diarrheal cases reported in May were so prolonged as to lead us to believe that they may have been cases of typhoid fever. The first of these was a private in Company L, who is recorded as having had diarrhea from May 24 to June 18. The second was a private in Company F, who is reported as having had diarrhea from May 30 to June 18. Both of these may

have been mild cases of typhoid fever. If they were typhoid fever, the regiment reached Chickamauga Park infected with this disease.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	989
Diarrhea	331
Malaria	11
Typhoid fever	12
Dysentery	2
Other diseases	16
Total	372

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,164
Diarrhea	282
Malaria	43
Typhoid fever	95
Dysentery	1
Other diseases	47
Total	468

It will be seen from this report that typhoid fever rapidly increased.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength not given.	
Typhoid fever	143
Malarial fever	82
Diarrhea	315
Not diagnosed	16
Other diseases	27
Total	583

This regiment left Chickamauga Park, Ga., August 26, 1898, and proceeded to Lexington, Ky. It remained at the latter place only a few days and then departed for Camp Ramsdell. We infer from the report that the regiment was furloughed on September 12, because there is no entry on the record for the month of September after this date.

The following is a list of the cases of typhoid and probable typhoid fever in this regiment:

- No. 1. Diarrhea, May 24 to June 18.
- No. 2. Diarrhea, May 30 to June 18.
- No. 3. Typhoid fever, June 4; furloughed August 16.
- No. 4. Diarrhea, June 4 to 19.
- No. 5. Diarrhea, June 4 to 19.
- No. 6. Diarrhea, June 4 to 17.
- No. 7. Malaria, June 8 to 23.
- No. 8. Malaria, June 16; still sick September 30.
- No. 9. Typhoid fever, June 18; disposition not given.
- No. 10. Malaria, June 18 to 29.
- No. 11. Typhoid fever, June 20; sent to division hospital June 23, and without further record.
- No. 12. Typhoid fever, June 23 to August 17.
- No. 13. Typhoid fever, June 26 to July 27.
- No. 14. Typhoid fever, June 29; sent to division hospital July 19, and without further record.
- No. 15. Typhoid fever, June 29 to July 16.
- No. 16. Typhoid fever, June 29 to July 24.

- No. 17. Typhoid fever, July 1; disposition not given.
- No. 18. Typhoid fever, July 1; died July 13.
- No. 19. Malaria, July 1 to 16.
- No. 20. Malaria, July 2 to 25.
- No. 21. Typhoid fever, July 2; sent to division hospital July 10. There is no further record of this case.
- No. 22. Typhoid fever, July 3; sent to division hospital July 8, and without further record.
- No. 23. Typhoid fever, July 5; disposition not given.
- No. 24. Malaria, July 7 to 26.
- No. 25. Diarrhea, July 7 to 20.
- No. 26. Malaria, July 8 to August 8.
- No. 27. Typhoid fever, July 8; furloughed July 23.
- No. 28. Typhoid fever, July 8; disposition not given.
- No. 29. Typhoid fever, July 9; disposition not given.
- No. 30. Typhoid fever, July 11; furloughed August 13.
- No. 31. Typhoid fever, July 12; sent to division hospital July 17, and without further record.
- No. 32. Malaria, July 13; sent to division hospital July 31. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 27.
- No. 33. Diarrhea, July 14 to 30.
- No. 34. Typhoid fever, July 14; sent to division hospital July 20, and without further record.
- No. 35. Diarrhea, July 15; furloughed July 17.
- No. 36. Malaria, July 15; furloughed July 29.
- No. 37. Malaria, July 16; furloughed August 20.
- No. 38. Malaria, July 16; still sick August 31.
- No. 39. Typhoid fever, July 16 to August 17.
- No. 40. Typhoid fever, July 17; furloughed August 30.
- No. 41. Typhoid fever, July 18; sent to division hospital July 31, and without further record.
- No. 42. Malaria, July 18 to August 17.
- No. 43. Diarrhea, July 18; still sick August 31.
- No. 44. Gastritis, July 19; still sick August 31.
- No. 45. Typhoid fever, July 19 to August 19.
- No. 46. Typhoid fever, July 19; no disposition given.
- No. 47. Typhoid fever, July 19; sent to division hospital July 21, and without further disposition.
- No. 48. Typhoid fever, July 19 to August 28.
- No. 49. Without diagnosis or date; sent to division hospital July 19. Here diagnosed as typhoid fever, and furloughed August 24.
- No. 50. Typhoid fever, July 21; sent to division hospital July 21, and without further disposition.
- No. 51. Malaria, July 21; still sick August 31.
- No. 52. Typhoid fever, July 21; sent to division hospital July 26, and without further record.
- No. 53. Typhoid fever, July 23 to August 17.
- No. 54. Typhoid fever, July 23; sent to division hospital July 26, and without further record.
- No. 55. Typhoid fever, July 23; furloughed August 12.
- No. 56. Typhoid fever, July 23; furloughed September 1.
- No. 57. Typhoid fever, July 23 to August 17.
- No. 58. Typhoid fever, July 23; sent to division hospital July 26, and without further record.
- No. 59. Typhoid fever, July 23; sent to division hospital July 23, and without further record.
- No. 60. Malaria, July 24; furloughed August 21.
- No. 61. Typhoid fever, July 25; sent to division hospital August 2, and without further record.
- No. 62. Typhoid fever, July 25; furloughed August 11. This man is recorded as having been returned to duty August 11; but, as we have stated elsewhere, it was customary in many regiments, when men were furloughed, to record them as returned to duty or to furlough duty.
- No. 63. Diarrhea, July 25; still sick August 31.
- No. 64. Typhoid fever, July 26; furloughed August 9.
- No. 65. Typhoid fever, July 26; furloughed August 30.

- No. 66. Typhoid fever, July 26; furloughed August 29.
 No. 67. Diarrhea, July 26; still sick August 31.
 No. 68. Typhoid fever, July 26; sent to division hospital August 1, and without further record.
 No. 69. Malaria, July 26; still sick August 31.
 No. 70. Typhoid fever, July 26 to August 31.
 No. 71. Typhoid fever, July 26; furloughed August 20.
 No. 72. Typhoid fever, July 26 to August 22.
 No. 73. Typhoid fever, July 26 to August 24.
 No. 74. Typhoid fever, July 26; sent to division hospital August 1, and without further record.
 No. 75. Typhoid fever, July 26 to August 20.
 No. 76. Typhoid fever, July 26 to August 20.
 No. 77. Typhoid fever, July 27; sick August 31.
 No. 78. Typhoid fever, July 27 to August 19.
 No. 79. Typhoid fever, July 27; sent to division hospital August 1, and without further record.
 No. 80. Malaria, July 27; still sick August 31.
 No. 81. Typhoid fever, July 28; disposition not given.
 No. 82. Typhoid fever, July 28; sent to division hospital August 2, and without further record.
 No. 83. Typhoid fever, July 28; sent to division hospital August 1, and without further record.
 No. 84. Typhoid fever, July 28; furloughed August 10.
 No. 85. Malaria, July 28; furloughed August 9.
 No. 86. Typhoid fever, July 28; furloughed August 7.
 No. 87. Typhoid fever, July 28; furloughed August 19.
 No. 88. Malaria, July 28; still sick August 31.
 No. 89. Typhoid fever, July 28; still sick August 31.
 No. 90. Typhoid fever, July 28; furloughed August 17.
 No. 91. Typhoid fever, July 29; furloughed August 15.
 No. 92. Typhoid fever, July 29; furloughed August 22.
 No. 93. Typhoid fever, July 29 to August 20.
 No. 94. Typhoid fever, July 29; sent to division hospital August 4, and without further record.
 No. 95. Typhoid fever, July 29; furloughed August 17.
 No. 96. Typhoid fever, July 29; sent to division hospital August 2, and without further record.
 No. 97. Typhoid fever, July 30; sent to division hospital August 21, and without further record.
 No. 98. Typhoid fever, July 30; furloughed August 27.
 No. 99. Typhoid fever, July 30; furloughed September 1.
 No. 100. Malaria, July 31; furloughed August 14.
 No. 101. Typhoid fever, July 31; furloughed August 14.
 No. 102. Typhoid fever, July 31; furloughed September 1.
 No. 103. Typhoid fever, July 31; furloughed September 21.
 No. 104. Typhoid fever, July 31; sent to division hospital August 5, and without further record.
 No. 105. Typhoid fever, July 31; furloughed August 19.
 No. 106. Malaria, July 31; furloughed August 14.
 No. 107. Malaria, August 1; furloughed August 12.
 No. 108. Malaria, August 1; furloughed August 14.
 No. 109. Typhoid fever, August 1; furloughed August 24.
 No. 110. Typhoid fever, August 1; furloughed August 24.
 No. 111. Diarrhea, August 1; still sick August 31.
 No. 112. Typhoid fever, August 1; sent to division hospital August 18, and without further record.
 No. 113. Typhoid fever, August 1; sent to division hospital August 4, and without further record.
 No. 114. Diarrhea, August 2; sent to division hospital August 4. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 20.
 No. 115. Malaria, August 2; still sick August 31.
 No. 116. Typhoid fever, August 2; sent to division hospital August 3, and without further record.
 No. 117. Typhoid fever, August 2; furloughed August 27.
 No. 118. Malaria, August 2; furloughed August 15.
 No. 119. Malaria, August 2; furloughed August 12.
 No. 120. Malaria, August 2; still sick August 31.
 No. 121. Diarrhea, August 2; furloughed August 12.
 No. 122. Typhoid fever, August 2; sent to division hospital August 11, and without further record.
 No. 123. Typhoid fever, August 3; furloughed August 29.
 No. 124. Malaria, August 3; furloughed August 15.
 No. 125. Typhoid fever, August 3; sent to division hospital August 6, and without further record.
 No. 126. Malaria, August 3; furloughed August 24.
 No. 127. Typhoid fever, August 3; furloughed September 1.
 No. 128. Malaria, August 3; sent to division hospital August 13. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.
 No. 129. Malaria, August 3; furloughed August 21.
 No. 130. Malaria, August 3; furloughed August 15.
 No. 131. Typhoid fever, August 3; furloughed August 24.
 No. 132. Typhoid fever, August 4; sent to division hospital August 22; furloughed August 30.
 No. 133. Malaria, August 4; furloughed August 10.
 No. 134. Typhoid fever, August 5; sent to division hospital August 21, and without further record.
 No. 135. Typhoid fever, August 5; died August 10.
 No. 136. Typhoid fever, August 5; furloughed August 25.
 No. 137. Diarrhea, August 5; furloughed August 25.
 No. 138. Malaria, August 5; furloughed August 19.
 No. 139. Malaria, August 5; furloughed August 22.
 No. 140. Diarrhea, August 5; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.
 No. 141. Malaria, August 6; sent to division hospital August 13. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.
 No. 142. Typhoid fever, August 6; furloughed August 22.
 No. 143. Malaria, August 6; furloughed August 23.
 No. 144. Typhoid fever, August 7; furloughed August 24.
 No. 145. Typhoid fever, August 7; sent to division hospital August 17, and without further record.
 No. 146. Typhoid fever, August 7; sent to division hospital August 9, and without further record.
 No. 147. Typhoid fever, August 7; sent to division hospital August 9, and without further record.
 No. 148. Diarrhea, August 7; furloughed August 24.
 No. 149. Typhoid fever, August 7; sent to division hospital August 17, and without further record.
 No. 150. Malaria, August 7; furloughed August 21.
 No. 151. Typhoid fever, August 8; furloughed August 26.
 No. 152. Typhoid fever, August 8; furloughed August 24.
 No. 153. Diarrhea, August 9; furloughed August 23.
 No. 154. Malaria, August 9; furloughed August 31.
 No. 155. Typhoid fever, August 9; sent to division hospital August 17, and without further record.
 No. 156. Typhoid fever, August 9; furloughed August 17.
 No. 157. Typhoid fever, August 9; furloughed August 26.
 No. 158. Typhoid fever, August 10; furloughed August 24.
 No. 159. Sent to division hospital August 10. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 29.
 No. 160. Typhoid fever, August 11; sent to division hospital August 21, and without further record.
 No. 161. Malaria, August 11; furloughed August 23.
 No. 162. Malaria, August 11; furloughed August 20.
 No. 163. Typhoid fever, August 12; sent to division hospital August 21, and without further record.
 No. 164. Typhoid fever, August 12; furloughed August 26.
 No. 165. Malaria, August 12; furloughed August 24.
 No. 166. Malaria, August 12; furloughed August 24.
 No. 167. Typhoid fever, August 12; furloughed August 30.
 No. 168. Typhoid fever, August 12; furloughed August 26.

No. 169. Typhoid fever, August 12; sent to division hospital August 27, and without further record.

No. 170. Typhoid fever, August 12; furloughed August 26.

No. 171. Typhoid fever, August 13; furloughed August 29.

No. 172. Typhoid fever August 13; furloughed August 26.

No. 173. Malaria, August 13; furloughed August 26.

No. 174. Typhoid fever, August 13; furloughed September 1.

No. 175. Malaria, August 14; sent to division hospital August 20. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.

No. 176. Typhoid fever, August 14; furloughed August 23.

No. 177. Typhoid fever, August 14; sent to division hospital August 23, and without further record.

No. 178. Typhoid fever, August 14; furloughed August 26.

No. 179. Diarrhea, August 14; furloughed August 25.

No. 180. Typhoid fever, August 14; furloughed September 18.

No. 181. Malaria, August 14; furloughed August 24.

No. 182. Typhoid fever, August 14; furloughed August 26.

No. 183. Malaria, August 14; sent to division hospital August 26. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.

No. 184. Malaria, August 14; sent to division hospital August 17. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.

No. 185. Typhoid fever, August 15; furloughed August 26.

No. 186. Typhoid fever, August 15; furloughed August 26.

No. 187. Typhoid fever, August 15; furloughed September 1.

No. 188. Typhoid fever, August 15; furloughed August 26.

No. 189. Typhoid fever, August 15; furloughed August 19.

No. 190. Typhoid fever, August 15; furloughed August 26.

No. 191. Typhoid fever, August 15; furloughed August 30.

No. 192. Typhoid fever, August 15; furloughed August 26.

No. 193. Typhoid fever, August 15; furloughed August 27.

No. 194. Malaria, August 16; furloughed August 24.

No. 195. Typhoid fever, August 16; furloughed August 24.

No. 196. Typhoid fever, August 16; furloughed August 30.

No. 197. Typhoid fever, August 16; died August 24.

No. 198. Malaria, August 16; sent to Sternberg Hospital August 24. Here the diagnosis was changed to continued malaria, and the patient was furloughed August 29.

No. 199. Typhoid fever, August 17; furloughed September 2.

No. 200. Diarrhea, August 17; sent to division hospital August 21. Here the diagnosis was changed to typhoid fever, and the patient was furloughed without date.

No. 201. Malaria, August 17; furloughed August 30.

No. 202. Diarrhea, August 17; furloughed August 28.

No. 203. Typhoid fever, August 17; furloughed September 1.

No. 204. Malaria, without date; sent to division hospital August 17, and furloughed August 30.

No. 205. Typhoid fever, August 18; furloughed August 26.

No. 206. Malaria, August 18; sent to Sternberg Hospital August 23. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.

No. 207. Malaria, August 18; furloughed August 24.

No. 208. Malaria, August 18; sent to division hospital August 24. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.

No. 209. Typhoid fever, August 18; furloughed August 26.

No. 210. Typhoid fever, August 18; furloughed September 1.

No. 211. Typhoid fever, August 18; furloughed August 26.

No. 212. Typhoid fever, August 18; furloughed August 21.

No. 213. Typhoid fever, August 18; sent to division hospital August 29, and without further record.

No. 214. Typhoid fever, August 18; furloughed August 26.

No. 215. Typhoid fever, August 19; furloughed September 5.

No. 216. Typhoid fever, August 19; furloughed August 20.

No. 217. Malaria, August 19; furloughed August 23.

No. 218. Typhoid fever, August 19; furloughed August 26.

No. 219. Typhoid fever, August 19; died August 21.

No. 220. Diarrhea, August 19; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.

No. 221. Malaria, without date; sent to Sternberg Hospital August 19. Here the diagnosis was changed to typhoid fever, and the patient died August 23.

No. 222. Malaria, without date; sent to Sternberg Hospital August 19. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 3.

No. 223. Malaria, August 19; still sick September 30.

No. 224. Malaria, without date; sent to division hospital August 20. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.

No. 225. Typhoid fever, August 20; furloughed August 24.

No. 226. Malaria, August 20; still sick September 30.

No. 227. Diarrhea, August 20; sent to Sternberg Hospital August 27. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 1.

No. 228. Typhoid fever, August 20; furloughed August 24.

No. 229. Typhoid fever, without date; sent to division hospital August 20; furloughed August 29.

No. 230. Malaria, without date; sent to division hospital August 20. Here diagnosed typhoid fever, and the patient was furloughed September 14.

No. 231. Malaria, August 20; still sick September 30.

No. 232. Malaria, without date; sent to division hospital August 20. Here the case was diagnosed as typhoid fever, and the patient was furloughed August 31.

No. 233. Malaria without date; sent to division hospital August 20; died August 24.

No. 234. Diarrhea, August 21; still sick September 30.

No. 235. Typhoid fever, August 21; furloughed August 27.

No. 236. Typhoid fever, August 21; furloughed August 29.

No. 237. Diarrhea, August 21; still sick September 30.

No. 238. Typhoid fever, August 21; furloughed August 26.

No. 239. Malaria, August 21; still sick September 30.

No. 240. Diarrhea, August 21; still sick September 30.

No. 241. Diarrhea, August 22; still sick September 30.

No. 242. Typhoid fever, August 22; furloughed August 26.

No. 243. Typhoid fever, August 23; sent to division hospital August 29 and without further record.

No. 244. Typhoid fever, August 23; sent to division hospital August 29; and without further record.

No. 245. Malaria, without date; sent to Sternberg Hospital August 23; died August 25.

No. 246. Malaria, without date; sent to Sternberg Hospital August 23; furloughed September 1.

No. 247. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to continued malaria, and the patient was furloughed October 8.

No. 248. Typhoid fever, August 23; furloughed August 26.

No. 249. Malaria, August 23; still sick September 30.

No. 250. Diarrhea, August 23; still sick September 30.

No. 251. Typhoid fever, August 24; furloughed September 1.

No. 252. Typhoid fever, August 24; furloughed September 1.

No. 253. Malaria, without date; sent to division hospital August 24. Here the case was diagnosed as typhoid fever, and the patient was furloughed August 30.

No. 254. Malaria, without date; sent to Sternberg Hospital August 25. Here the disease was diagnosed as typhoid fever, and the patient was furloughed August 30.

No. 255. Malaria, August 25; still sick September 30.

No. 256. Typhoid fever August 25; furloughed August 30.

No. 257. Malaria, without date; sent to Sternberg Hospital August 25. Here the disease was diagnosed as typhoid fever, and the patient was furloughed September 18.

No. 258. Malaria, without date; sent to Sternberg Hospital August 25. Here the disease was diagnosed as continued malaria, and the patient was furloughed September 1.

No. 259. Malaria, without date; sent to Sternberg Hospital August 25. Here the disease was diagnosed as continued malaria, and the patient was furloughed September 1.

No. 260. Typhoid fever, August 26; sent to division hospital August 30; and without further record.

No. 261. Typhoid fever, August 26; sent to division hospital August 31; and without further record.

No. 262. Typhoid fever, August 28; furloughed September 18.

No. 263. Typhoid fever, August 29; sent to hospital August 31; and without further record.

No. 264. Typhoid fever, August 29; sent to hospital August 31; and without further record.

No. 265. Typhoid fever, August 29; sent to division hospital August 31; and without further record.

No. 266. Typhoid fever, August 29; disposition not given.

No. 267. Typhoid fever, August 30; sent to hospital August 31; and without further record.

No. 268. Typhoid fever, August 30; sent to hospital August 31; and without further record.

No. 269. Typhoid fever, August 30; sent to hospital August 31; and without further record.

No. 270. Typhoid fever, August 30; sent to division hospital August 31; and without further record.

No. 271. Typhoid fever, August 30; sent to division hospital August 31; and without further record.

No. 272. Typhoid fever, August 30; sent to hospital August 31; and without further record.

No. 273. Typhoid fever, August 30; sent to hospital August 31; and without further record.

No. 274. Typhoid fever, August 30; sent to hospital August 31; and without further record.

No. 275. Typhoid fever, August 31; sent to hospital September 2; and without further record.

No. 276. Typhoid fever, September 1; sent to hospital September 3; and without further record.

No. 277. Typhoid fever, September 1; sent to hospital September 3; and without further record.

No. 278. Typhoid fever, September 1; sent to division hospital September 3; and without further record.

No. 279. Typhoid fever, September 1; sent to hospital September 1; and without further record.

No. 280. Typhoid fever, September 1; sent to hospital September 2; and without further record.

No. 281. Typhoid fever, September 1; sent to hospital September 3; and without further record.

No. 282. Typhoid fever, September 1; sent to hospital September 3; and without further record.

No. 283. Typhoid fever, September 1; sent to hospital September 3; and without further record.

No. 284. Typhoid fever, September 2; sent to hospital September 4; and without further record.

No. 285. Typhoid fever, September 2; sent to hospital September 4; and without further record.

No. 286. Typhoid fever, September 2; sent to hospital September 4; and without further record.

No. 287. Typhoid fever, September 2; sent to hospital September 2; and without further record.

No. 288. Typhoid fever, September 2; sent to hospital September 3; and without further record.

No. 289. Typhoid fever, September 2; sent to hospital September 3, and without further record.

No. 290. Typhoid fever, September 2; sent to hospital September 4, and without further record.

No. 291. Typhoid fever, September 3; sent to hospital September 5, and without further record.

No. 292. Typhoid fever, September 4; sent to hospital September 6, and without further record.

No. 293. Typhoid fever, September 5; sent to division hospital September 6, and without further record.

No. 294. Typhoid fever, September 5; sent to division hospital September 6, and without further record.

No. 295. Typhoid fever, September 5; sent to hospital September 6, and without further record.

No. 296. Typhoid fever, September 11; sent to division hospital September 24, and without further record.

No. 297. Typhoid fever, September 12; sent to hospital September 13, and without further record.

SUMMARY.

Assembled at Camp Ramsdell, N. H., in April, 1898.

Mustered into United States service May 12, 1898.

Arrived at Chickamauga Park, May 22, 1898.

Strength on arrival, 1,007.

Date of first case of probable typhoid fever, May 24, 1898.

Date of first case of recognized typhoid fever, June 4, 1898.

Left Chickamauga Park, August 26, 1898.

Strength on departure, 1,296.

Number of cases of probable typhoid fever developed at Chickamauga Park 261

Number of cases of probable typhoid fever developed after leaving Chickamauga Park 36

Total number of cases of probable typhoid fever developed in the First New Hampshire Volunteer Infantry from May to September 12, 1898..... 297

These 297 cases were diagnosed as follows:

Typhoid fever..... 213

Malaria..... 59

Diarrhea..... 24

Gastritis..... 1

Total..... 297

The following is a list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898				
Aldrich, Darwin W....	Sgt., L.	July 31	Camp Thomas, Ga....	Typhoid.
Angier, John C.....	Pvt., L.	Sept. 7	.....do.....	Do.
Banfill, William W....	Pvt., E.	Aug. 21	.....do.....	Do.
Bergeron, Joseph.....	Pvt., H.	Aug. 25	Chickamauga Park, Ga.	Enteric fever.
Boudreau, Oliver.....	Pvt., F.	Sept. 9	Manchester, N. H....	Typhoid.
Bradbury, William R..	Pvt., A.	Oct. 8	Concord, N. H....	Do.
Clement, Russ.....	Pvt., M.	Aug. 8	Camp Thomas, Ga....	Do.
Connors, William J....	Pvt., I.	Sept. 15	Manchester, N. H....	Do.
Dervin, William H....	Sgt., B.	Aug. 12	Camp Thomas, Ga....	Pneumonia.
Filgate, William L....	Pvt., K.	Oct. 9	The Weirs, N. H....	Typhoid.
Gaffney, Edward H....	Pvt., I.	Aug. 17	Camp Thomas, Ga....	Do.
Gilman, Nelson E.....	Corpl., K.	Aug. 24	.....do.....	Do.
Hallisey, John J.....	Pvt., I.	Aug. 4	Fort Thomas, Ky....	Do.
Johnson, Roland A....	Pvt., I.	July 13	.....do.....	Do.
Keefe, Frederick A....	Pvt., C.	Sept. 6	Manchester, N. H....	Do.
King, Thomas E.....	Pvt., C.	Aug. 24	Camp Thomas, Ga....	Fever.
Malouson, Henry.....	Pvt., C.	Sept. 27	Concord, N. H....	Typhoid.
Morrill, Alfred J.....	Corpl., K.	Aug. 12	Camp Thomas, Ga....	Do.
Peters, Levi W.....	Pvt., I.	Sept. 16	Concord, N. H....	Do.
Rafter, John.....	Pvt., M.	Sept. 6	Grafton, W. Va.....	Do.
Reed, Harold S.....	Pvt., E.	Nov. 18	Concord, N. H....	Septicæmia.
Roberts, Cassius B....	Corpl., F.	Aug. 3	Camp Thomas, Ga....	Typhoid.
Rossiter, William A....	Mus., F.	Aug. 24	.....do.....	Fever and hemorrhages.
Sanborn, William A....	Capt., K.	.....do....	Chickamauga Park, Ga.	Typhoid.
Scruton, Frank M....	Pvt., M.	Oct. 3	Farmington, N. H....	Do.
Silver, Julius M.....	Pvt., D.	Aug. 19	Camp Thomas, Ga....	Fever.
Simonds, Robert.....	Pvt., H.	Sept. 3	Franklin, N. H....	Typhoid.
Stoddard, Leslie R....	Pvt., L.	Oct. 3	Chesterfield, N. H....	Do.
Stowell, Ira.....	Capt., M.	Aug. 31	Chattanooga, Tenn..	Do.
Sullivan, Charles J....	Pvt., K.	Oct. 6	Manchester, N. H....	Do.
Swain, William G.....	Pvt., G.	Aug. 18	No place given.....	Do.
Weatherwax, O. J.....	Pvt., M.	Aug. 23	Chickamauga Park, Ga.	Do.

This gives a total of 32 deaths, 30 of which were due to typhoid fever.

Percentage of deaths among probable cases (297), 10.10.

Percentage of deaths among recognized cases (213) of typhoid fever, 14.08.

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST
NEW HAMPSHIRE VOLUNTEER INFANTRY.

Medical officers.

James T. Greeley, major and surgeon, Nashua, N. H.
Charles E. Congden, lieutenant and assistant surgeon, Berlin, N. H.
Russell Wilkins, lieutenant and assistant surgeon, Concord, N. H.

Major Greeley states:

With the exception of the first few days, the rations, both as regards quality and quantity, were all that could be desired.

The entire regimental camp was inspected each day by the colonel and surgeon, when all kitchens and all sinks were looked into. Each Sunday this inspection was more formal and more extended, including the inspection of the company streets, the tents, inside and out, all ordnance, shelter-tent rolls, the hospital and its contents, including patients, medicines and supplies. The officer of the day and the company officers also made daily inspections. Moreover, each day the regiment was visited and inspected by a medical officer from the division, and also by the brigade surgeon. Then the division inspector of the week visited and inspected the camp each day.

In regard to the policing of the camp, I can only say that the camp was kept in a scrupulously neat condition, notwithstanding the fact that our camp site was one of the worst in Chickamauga Park, being over a ledge and very rocky. The sinks were kept covered and ditched, pieces of paper, kitchen refuse, and debris of all kinds were removed and burned or buried at once, so that the neatness of the camp was proverbial. During the rains the water ran into and collected in the sinks, owing to the clayey nature of the soil, to such an extent as to occasionally deposit the contents on the adjoining ground.

The instructions given in regard to the sinks were, in a general way, that they should be located at the foot of the company streets, a certain number of feet from the company kitchens; that they should be dug at least 8 feet deep; that they should be kept covered with fine earth as fast as used; that when within 18 inches of the surface of the ground they should be finally covered and marked, and that they should be well ditched. The nature of the soil rendered the digging of an 8-foot sink, except in rare instances, an impossibility. The care and use of the sinks were, however, commendable, and the instructions given followed as well as the natural conditions of the ground would permit. The instructions given in regard to drinking water were simply that no unboiled water should at any time or under any circumstances be drunk. This was, however, nearly impossible to carry out until the regiment was able to obtain, through the quartermaster's department, a considerable increase in the number of barrels and boilers originally issued. This increase was not obtained for many weeks, and in the meantime much polluted, unboiled water was undoubtedly consumed.

The line officers, with the exception of the ordinary details, were continually with their companies. The field was somewhat reduced in strength through severe sickness of the two senior majors. The staff was fairly represented with the exception of the chaplain, who resigned in June, and the surgeon and one assistant surgeon, who were detailed, the first to the division hospital, and the other to the ambulance company early in the summer.

All sick, except those merely indisposed, were sent to the division hospital by the ambulance, which called at the regiment each morning. In other words, the regimental hospital was reduced to a dispensary. This method answered all requirements until the epidemic of typhoid fever became marked, then our small regimental hospital overflowed, notwithstanding our efforts to enlarge it to meet the increasing demand. The maximum number of beds in our regimental hospital was 56. These, together with most of the medicines used, including milk, malted milk, ice, etc., were supplied by the New Hampshire State Aid Society fund, the divi-

sion hospital being unable to honor my requisitions except in rare instances.

Our regiment remained in one camp nearly all the time while at Chickamauga Park, changing only to more open ground a short time before being ordered to Lexington, Ky. One week was spent at Lexington before the regiment was ordered home, furloughed, and mustered out of the United States service.

NINTH PENNSYLVANIA VOLUNTEER INFANTRY.

Third Brigade, Third Division, First Army Corps.

The first report is signed by Maj. W. S. Stewart.

CONDENSED SICK REPORT FROM MAY 10 TO 31.

Mean strength	640
Intermittent fever	3
Acute diarrhea	19
Enterocolitis	3
Acute gastritis	2
Other diseases	7
Total	34
Admissions from command	24
Disposition:	
Returned to duty	13
Remaining on sick report—	
Hospital	9
Quarters	2
Total	24

The June report is signed by W. G. Weaver, surgeon in charge, who makes the following remarks:

Typhoid fever has been prevalent. The cause has not been ascertained. Orders have been issued compelling the boiling of all drinking water and the filling up of all surface holes and the immediate policing of the sinks after their use. Flies may have carried the germs from the excreta to the mess tents.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,044
Typhoid fever	12
Intermittent fever	8
Fever	1
Hepatitis	1
Acute diarrhea	47
Enterocolitis	10
Acute gastritis	1
Chronic diarrhea	1
Gastro-enteritis	1
Debility following diarrhea	1
Other diseases	45
Total	128
Admissions:	
Remaining from last month	7
From command	141
Total	148
Disposition:	
Returned to duty	124
Remaining on sick report—	
Hospital	14
Quarters	10
Total to be accounted for	148

The July report is signed by Major Stewart without comment.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,204
Typhoid fever.....	31
Intermittent malaria.....	82
Intermittent fever.....	24
Acute diarrhea.....	159
Hepatitis.....	1
Malaria.....	3
Remittent fever.....	2
Chronic diarrhea.....	4
Debility following diarrhea.....	1
Indigestion.....	4
Other diseases.....	23
Total	334
Admissions:	
Remaining from last month.....	15
From command.....	288
Total to be accounted for.....	303
Returned to duty.....	296
Died.....	5
Discharged for disability.....	2
Total	303
Remaining on sick report:	
Hospital.....	26
Quarters.....	93
Total	119

It will be seen that the above-given figures show discrepancies. However, we have not felt authorized to make any changes in them.

The August report is signed by Major Stewart without remarks.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,301
Typhoid fever.....	98
Intermittent malaria.....	192
Intermittent fever.....	5
Hepatitis.....	1
Remittent malaria.....	2
Acute diarrhea.....	157
Total	455
Admissions:	
Remaining from last month.....	37
From command.....	258
Total to be accounted for.....	295
Completed cases:	
Returned to duty.....	285
Died.....	9
Discharged for disability.....	1
Total	295

Remaining on sick report:

Hospital.....	19
Quarters.....	59
Total	78

The September report is signed by Maj. W. S. Stewart, per Claude R. Grosser, assistant surgeon. This report contains no comments.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength.....	1,270
Typhoid fever.....	93
Intermittent malaria.....	98
Intermittent fever.....	5
Hepatitis.....	1
Acute diarrhea.....	77
Indigestion.....	7
Other diseases.....	44
Total	325

We have gone over the sick reports for this regiment and have made a list of cases of probable typhoid fever, but want of space will not permit us to insert it. The most essential points will be brought out in the summary.

SUMMARY.

Assembled at Mount Gretna, Pa., in April, 1898.	
Mustered into United States service May 10, 1898.	
Arrived at Chickamauga Park, May 20, 1898.	
Strength on arrival, 640.	
Date of first case of probable typhoid fever, May 31, 1898.	
Date of first case of recognized typhoid fever, June 14, 1898.	
Left Chickamauga Park, August 26, 1898.	
Strength on departure, 1,291.	
Number of cases of probable typhoid fever developed at Chickamauga Park.....	287
Number of cases of probable typhoid fever developed after leaving Chickamauga Park from August 27 to September 13.....	47
Total number of cases of probable typhoid fever developed in the Ninth Pennsylvania Volunteer Infantry from May to September 13, 1898.....	334
These 334 cases were diagnosed as follows:	
Typhoid fever.....	155
Malaria.....	128
Diarrhea.....	51
Total	334
These cases were distributed through the companies as follows:	
Staff and band.....	3
Company A.....	28
Company B.....	18
Company C.....	38
Company D.....	26
Company E.....	25
Company F.....	25
Company G.....	35
Company H.....	19
Company I.....	18
Company K.....	36
Company L.....	30
Company M.....	33
Total.....	334

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Armbruster, V. J.	Pvt., L.	Aug. 12	Chickamauga, Ga.	Typhoid.
Bell, Oliver H.	Capt., D.	Sept. 9	Camp Thomas, Ga.	Do.
Chilsom, Glenn B.	Pvt., M.	Aug. 31	do	Do.
Cohen, Barney	Pvt., E.	July 22	No place given	Do.
Deegan, Leonard	Pvt., D.	Aug. 9	Camp Thomas, Ga.	Do.
Deitrick, Henry A.	Pvt., B.	Sept. 9	Wilkesbarre, Pa.	Do.
Detweiler, Frank	Pvt., G.	Aug. 10	Camp Thomas, Ga.	Do.
Fry, Frank D.	Pvt., A.	Aug. 22	do	Do.
Gilmartin, Wm.	Pvt., H.	July 2	Chickamauga, Ga.	Do.
Holsey, John J.	Pvt., C.	Aug. 1	Camp Thomas, Ga.	Do.
Jackson, Carver W.	Pvt., B.	Sept. 18	Harveys Lake, Pa.	Do.
Jenkins, Jonah A.	Pvt., F.	Aug. 10	Camp Thomas, Ga.	Do.
Klutz, Robert	Pvt., K.	Sept. 2	Chickamauga, Ga.	Continued malaria.
Mahoney, James	Pvt., M.	Oct. 23	Towanda, Pa.	Congestion of brain.
Miers, Darias L.	Capt., E.	Aug. 27	Wilkesbarre, Pa.	Typhoid.
Moore, Charles F.	Pvt., M.	Aug. 31	Chickamauga, Ga.	Do.
Pointon, Wm.	Pvt., C.	Aug. 1	Camp Thomas, Ga.	Do.
Powell, John L.	Pvt., C.	Oct. 22	Pittston, Pa.	Do.
Rhodes, George	Pvt., E.	Sept. 3	Wilkesbarre, Pa.	Do.
Savage, Benj. F.	Sgt., F.	July 30	Chickamauga, Ga.	Do.
Schmidt, J. A.	Pvt., F.	July 27	do	Do.
Shaffer, Frank	Pvt., K.	Sept. 6	Camp Hamilton, Ky.	Do.
Stearns, Demson	Capt., B.	do	Wilkesbarre, Pa.	Do.
Terry, Draper T.	Cpl., M.	Sept. 25	No place given	Do.
Thomas, John R.	Pvt., A.	July 18	do	Do.
Thomas, Wm. F.	Pvt., A.	July 11	Camp Thomas, Ga.	Do.
Trainer, Michael	Pvt., F.	Sept. 27	Wilkesbarre, Pa.	Appendicitis.

This gives a total of 27 deaths, 25 of which were due to typhoid fever, which is equivalent to 7.48 per cent of our probable cases.

Percentage of deaths among recognized cases (155) of typhoid fever, 16.12.

COMMUNICATIONS FROM THE SURGEONS OF THE NINTH PENNSYLVANIA VOLUNTEER INFANTRY.

Medical officers.

Walter S. Stewart, major and surgeon, Wilkesbarre, Pa.

Charles H. Muier, lieutenant and assistant surgeon, Wilkesbarre, Pa.

Claude R. Grosser, lieutenant and assistant surgeon, Wilkesbarre, Pa.

Major Stewart states:

Our camp at Chickamauga lay facing the Vinyard and Alexander road about 500 yards from the site of Alexander House. Here, on this limited amount of ground, our camp was laid out. The ground covered by a growth of young timber sloped down from a low ridge to the roadway, which was from 2 to 6 feet or more higher than the camp ground adjoining, and thus well fitted to act as a dam breast, and retain any water which might flood down over camp. Beyond this road, at a distance of some 800 feet, the Chickamauga Creek winds in and out among the trees that fringe the banks. Between this creek and our camp lay an open field used as a drill ground and dry enough in dry weather, but practically a marsh after some of the hard rains we experienced. The soil upon which our camp lay is exceedingly hard and rocky, and it was possible to dig the sinks for mess refuse and the latrines to a depth of only about 2 or 3 feet, thus necessitating the frequent digging of new ones, and quickly filling in all of our available space. By positive orders of General Bates we were obliged to place all our sinks on the side of the road next to the camp. Hence the elevated road instead of being an aid to us was an actual source of danger. We had at the most but 75 feet between our cook fires and the road, in some instances not that much space. Consider for a moment this proximity of the sinks and the kitchens, the hard nature of the soil, which allowed practically no absorption of the rains, and the road, at the foot of the camp, which blocked back the rain water over the sinks up toward our kitchens, and you can readily imagine what we had thrust upon us after a short occupation of these grounds.

We had a perfect pest hole at our very doors, and despite the most careful and thorough use of lime and other disinfectants, we could do nothing to obviate the danger staring us in the face. I might add it was with the greatest difficulty that we succeeded in getting disinfectants.

About June 29 a request was made for permission to move the sinks across the road, and finally, on July 11, we received from brigade headquarters authority to do so. However, before the work had progressed very far, General Sanger, commanding officer of the division, came up and ordered the men to cease work and keep the sinks in their old location. The commanding officer of the regiment then went to the chief surgeon of the division, and, finally, with the aid of the medical staff got permission on July 24, to move the sinks beyond the road.

The close proximity of the sinks was, in my opinion, one of the causes of so much fever in the Ninth Regiment. When we first moved into camp our water supply was taken from wherever we could get it—from the creek, from the surface springs, etc.—but after a few days barrels were supplied, and then it was hauled from Blue Spring, 5 miles away, and was apparently good and pure water. They also hauled water from artesian wells which were sunk in different parts of the park, one close to our regiment. I always thought that they were a source of contagion; afterwards they were ordered closed.

On June 29 General Brooke issued an order requiring us to use the water brought through pipes from a pumping station on Chickamauga Creek, above the camping grounds. This order stated that, after analysis of all the water supplies, that of the creek was found to be the best, and hence it was to be boiled and used for drinking purposes.

On the 11th of July this water was condemned and the men were forbidden to bathe in the creek on account of the danger of contagion. I inclose you the orders. You will also find inclosed the order issued for the routine daily work in our division which practically speaks for itself, giving the men only about seven and one-half hours' sleep or rest in the twenty-four hours. In that hot climate, for northern men the work was entirely too arduous.

It was a recognized fact, not only with the officers of the regiment but with the men, that their only salvation was to have this camp moved to another part of the park, and with this in view the colonel commanding set to work, but not until August 4 did he get permission to change his camp to the Smith White field and a fine open piece of ground with plenty of room and a more porous soil. This camp was beautifully laid out. The sinks for the men were placed 150 yards from the tents with well-built closets, the money for which was supplied from private funds. The kitchen sinks were placed within 10 yards of the kitchens and were constructed as follows: Sink holes were dug 16 feet long, 4 feet wide, and 8 feet deep. Across the top cord wood was placed with an opening 2 feet square in the center; over this was placed a box shaft 2 feet square and 3 feet high with hinged lid on top. All the earth taken from the sink holes was then filled, mound shaped around the square box shaft, making concealed sink holes. One such sink was provided for each company and owing to their size they were ample to last a month before being filled. On August 25 the regiment was ordered to Lexington, where we had a beautiful camp about 7 miles from the city. This camp was modeled after the one on the Smith White field. The water was piped from the city reservoir, of good quality, and plenty of it. Very few cases of fever appeared after the first ten days.

I can not correct any of the figures in the sick report, but will make this statement: That many of the cases put down there as malaria and diarrhea were typhoid, and the discrepancy occurred in this way: The man making out the reports took the regimental diagnosis, which was made before the patient was transferred to the division hospital, where it was afterwards diagnosed typhoid. The mistake will be found in the majority of the sick reports and can only be corrected by comparing these reports with the division hospital reports.

While I believe the water was the first cause of contagion, the indiscreet habits of the volunteer soldier was largely the cause of so much fever. One of the strong arguments in favor of the flies as a cause of contagion was that very rarely did you find a case of fever among the staff officers, and that is explained by the fact that they all had their mess tents screened.

General Orders, } HDQRS. 3D DIVISION, FIRST ARMY CORPS,
No. 36. } *Camp George H. Thomas, Ga., July 11, 1898.*

The following hours of service and roll call of the division will take effect to-morrow, July 12.

Reveille, first call, 4.30 a. m.; reveille, 4.40 a. m.; assembly, 4.45 a. m.

Mess, 5 a. m.

Fatigue, 5.30 a. m.

Sick, 5.45 a. m.

Recall from fatigue.

Inspection of company tents, grounds, etc., 6.15 a. m.

Drill, 6.30 a. m.; assembly, 6.40 a. m.

Recall, 8.40 a. m.

Sunday inspection, first call, 7.45 a. m.; assembly, 8 a. m.

Monthly inspection of regiments, first call, 7.45 a. m.; assembly, 8 a. m.

Guard mounting, 9.20 a. m.; assembly, 9.30 a. m.

First sergeants, 11.30 a. m.

Mess, 12 m.

Fatigue, 1 p. m.

School, 1.20 p. m.; assembly, 1.30 p. m.

Recall from fatigue, 2.30 p. m.

Drill, 3.20 p. m.; assembly, 3.30 p. m.

Recall, 5 p. m.

Parade (daily), first call, 6 p. m.; assembly, 6.15 p. m.

Retreat when there is no parade, first call, 6.15 p. m.; assembly, 6.30 p. m.

Tattoo, 8.30 p. m.; assembly, 8.45 p. m.

Taps, 9 p. m.

By command of Brigadier-General Sawyer:

H. L. SCOTT,
Assistant Adjutant-General.

General Orders, } HDQRS. 3D BRIGADE,
No. 129. } THIRD DIVISION, FIRST ARMY CORPS,
} *Camp George H. Thomas, Ga., July 11, 1898.*

In order to promote the general health of the troops in this brigade and to remove a possible source of illness now prevalent, the general commanding directs the commanding officers of the several regiments to forbid bathing in Chickamauga Creek.

By command of Brigadier-General Andrews:

WALTER L. BOUVE,
Assistant Adjutant-General.

HEADQUARTERS THIRD BRIGADE, THIRD DIVISION,
FIRST ARMY CORPS,

Camp George H. Thomas, Ga., June 29, 1898.

Commanding Officers, Ninth Pennsylvania, First New Hampshire, and Second Missouri Volunteers.

SIRs: The brigadier-general commanding the division informs the colonel commanding that General Brooke has had all the water in this vicinity examined, and finds that the water from Chickamauga Creek, which is pumped through the pipe line, is better than that of the Blue Spring or other springs. You are therefore directed to use water from the pipe line, taking care to see that all of it is boiled. While the water from the pipe line has more sediment and is dirtier than that from Blue Spring, still in the process of boiling it will be precipitated. All water must be boiled in accordance with previous directions.

A requisition from this brigade has been made for wash boilers for each company, and an additional barrel for each company, as well as for 500 pounds of chloride of lime as a disinfectant for the sinks. When this supply shall have been received they will be distributed to the regiments.

By command of Colonel Dougherty:

WALTER L. BOUVE,
Assistant Adjutant-General.

GENERAL REMARKS CONCERNING TYPHOID FEVER IN THE THIRD DIVISION OF THE FIRST ARMY CORPS.

All the regiments of this division, excepting the First South Carolina, arrived at Chickamauga Park, Ga., practically at the same time (May 20), all left about the same time (August 23 to 27), and all went to Lexington, Ky. The following table gives figures showing some of the most important facts concerning typhoid fever in the different regiments of this division:

Brigade and regiment.	Date of first case.	Total number of cases.	Number of recognized cases.	Total deaths.	Deaths from typhoid.	Percent of deaths among probable cases.	Percent of deaths among recognized cases.
<i>First Brigade.</i>							
Fifth Pennsylvania.....	May 19	338	152	16	16	4.73	10.52
Twelfth Minnesota.....	May 20	433	144	19	19	4.38	13.12
<i>Second Brigade.</i>							
Eighth Massachusetts.....	May 28	272	157	30	19	7	12.10
Twenty-first Kansas.....	May 21	294	95	23	21	7.14	22.10
Twelfth New York.....	June 6	490	144	21	20	4.08	13.89
<i>Third Brigade.</i>							
Second Missouri.....	May 26	268	181	29	19	7.09	10.49
First New Hampshire.....	May 24	297	213	32	30	10.10	14.08
Ninth Pennsylvania.....	May 31	334	155	27	25	7.48	16.13

Total number of cases of probable typhoid fever in the eight regiments.....	2,726
Total number of cases of recognized typhoid fever in the eight regiments.....	1,241
Total number of deaths in the eight regiments.....	188
Total number of deaths from typhoid fever in the eight regiments.....	169
Percentage of deaths among probable cases of typhoid fever.....	6.19
Percentage of deaths among recognized cases of typhoid fever.....	13.61

The mean strength of these eight regiments from May to September, as nearly as we can ascertain, was 10,329. Figuring on this basis we find the percentage of probable typhoid fever in these eight regiments to be 26.39.

It was quite generally believed among medical officers at Chickamauga that the Second Division of this corps developed typhoid fever much later than the Third Division. As we have already learned, the Second Division obtained its water supply from wells and springs. The Third Division obtained its water supply principally from the pipes that distributed the water of Chickamauga Creek. Many army medical officers believed that the Chickamauga Creek water became contaminated early in July and that regiments supplied with that water developed typhoid fever much more prominently and rapidly than the other regiments did. In order to determine how much of truth there may have been in this general idea we will tabulate the principal figures concerning typhoid fever in both of these divisions. In doing so we will omit the One hundred and sixtieth Indiana from the Second Division

and the First South Carolina from the Third Division. This will make the mean strength of the two divisions practically the same. We omit these two regiments because both of them left Chickamauga much earlier than the other regiments. Onitting these two, all the regiments of the Second and Third Divisions reached Chickamauga within a few days (May 17 to 22) and all left within a few days (August 21 to 29), with the exception of the fact that the First Georgia did not reach Chickamauga until June 17. However, this regiment had been encamped at Griffin, Ga., and we will include the cases of typhoid fever developed in this regiment at that place.

SECOND DIVISION.

Brigade and regiment.	Date of first case.	Number of cases developed at Chickamauga.	Total number of cases.	Total deaths.	Deaths from typhoid.
<i>First Brigade.</i>					
Thirty-first Michigan	June 1	95	239	27	16
First Georgia	June 6	85	120	10	9
<i>Second Brigade.</i>					
One hundred and fifty-eighth Indiana	June 6	95	128	12	10
Sixth Ohio	May 18	70	291	21	19
First West Virginia	June 6	85	260	15	12
<i>Third Brigade.</i>					
First Pennsylvania	May 12	129	222	14	12
Fourteenth Minnesota	May 27	114	286	13	12
Second Ohio	May 20	160	403	14	13
Total		833	1,949	126	103

THIRD DIVISION.

<i>First Brigade.</i>					
Fifth Pennsylvania	May 19	182	338	16	16
Twelfth Minnesota	May 20	320	433	19	19
<i>Second Brigade.</i>					
Eighth Massachusetts	May 28	55	272	30	19
Twenty-first Kansas	May 21	153	294	23	21
Twelfth New York	June 6	197	490	21	20
<i>Third Brigade.</i>					
Second Missouri	May 26	149	268	20	19
First New Hampshire	May 24	261	297	32	30
Ninth Pennsylvania	May 31	287	334	27	25
Total		1,604	2,726	188	169

Total number of cases of probable typhoid fever in eight regiments of the Second Division	1,949
Total number of cases of probable typhoid fever in eight regiments of the Third Division	2,726
Excess of cases of probable typhoid fever in the Third Division over those in the Second Division	777
Total number of cases of probable typhoid fever developed in eight regiments of the Second Division at Chickamauga.	833
Total number of cases of probable typhoid fever developed in eight regiments of the Third Division at Chickamauga.	1,604
Excess of cases of probable typhoid fever developed at Chickamauga in the Third Division over those developed in the Second Division	771
Total number of deaths in eight regiments of the Second Division	126
Total number of deaths in eight regiments of the Third Division	188
Excess of deaths in the Third Division over those in the Second Division	62

Total number of deaths from typhoid fever in eight regiments of the Second Division	103
Total number of deaths from typhoid fever in eight regiments of the Third Division	169
Excess of deaths from typhoid fever in the Third Division over those in the Second Division	66
Percentage of deaths among probable cases of typhoid fever in the Second Division	5.28
Percentage of deaths among probable cases of typhoid fever in the Third Division	6.19

We certainly must conclude from the above given figures that the general idea prevalent among medical officers at Chickamauga that typhoid fever was much more prevalent in the Third Division of the First Army Corps than in the Second Division of the same corps is correct. Typhoid fever diffused more rapidly and more widely through the Third Division than it did through the Second Division. Whether or not the greater prevalence of typhoid fever in the Third Division was due to the fact that the regiments of this division used Chickamauga Creek water we will not at present attempt to determine. We will leave the discussion of this subject until we have studied typhoid fever in the Third Corps.

Summary of deaths in the Third Division of the First Army Corps.

Brigade and regiment.	Total deaths.	Deaths due to typhoid fever.
<i>First Brigade.</i>		
Fifth Pennsylvania	16	16
Twelfth Minnesota	19	19
First South Carolina	20	10
Total	56	45
<i>Second Brigade.</i>		
Eighth Massachusetts	30	19
Twenty-first Kansas	23	21
Twelfth New York	21	20
Total	74	60
<i>Third Brigade.</i>		
Second Missouri	20	19
First New Hampshire	32	30
Ninth Pennsylvania	27	25
Total	79	74
Total deaths	210	
Deaths due to typhoid fever	190	
Percentage of deaths from typhoid to total deaths	85.71	

In comparing the extent to which typhoid fever prevailed in the different organizations of this corps, one question that very naturally arises is: Did the regiments that remained at Chickamauga suffer more or less from typhoid than those that left Chickamauga earlier in the season? In order to study this question we will divide the regiments of this corps into two groups. The first group will contain those regiments that left Chickamauga before August 3, 1898; the second group will contain those regiments which left Chickamauga subsequent to August 3, 1898. We will endeavor to ascertain which of these groups of regiments suffered more severely from typhoid fever and which had the greater death rate. In making this comparison we will have to depend upon the total number of deaths and the deaths attributed to typhoid fever.

FIRST GROUP.

Regiments.	Total deaths.	Deaths from typhoid.	Per cent of deaths among probable cases.	Per cent of deaths among recognized cases.
First Kentucky.....	28	18	6.87	20.45
Third Wisconsin.....	36	25	6.61	23.36
Fifth Illinois.....	16	8	6.4	7.08
Fourth Ohio.....	26	19	.....	.....
Third Illinois.....	44	25	4.57	16.77
Fourth Pennsylvania.....	35	24	.....	.....
Sixteenth Pennsylvania.....	41	34	.....	.....
Second Wisconsin.....	41	27	8.20	23.89
Third Kentucky.....	17	11	5.02	.....
One hundred and sixtieth Indiana.....	11	8	3.38	17.02
First South Carolina.....	20	10	.....	.....

SECOND GROUP.

Thirty-first Michigan.....	27	16	6.69	18.60
First Georgia.....	10	9	7.50	25
One hundred and fifty-eighth Indiana.....	12	10	7.81	20.40
Sixth Ohio.....	21	19	6.52	12.83
First West Virginia.....	15	12	4.61	11.32
First Pennsylvania.....	14	12	5.40	7.10
Fourteenth Minnesota.....	13	12	4.19	8.21
Second Ohio.....	14	13	3.22	6.77
Fifth Pennsylvania.....	16	16	4.73	10.52
Twelfth Minnesota.....	19	19	4.38	13.19
Eighth Massachusetts.....	30	19	6.98	12.10
Twenty-first Kansas.....	23	21	7.14	22.10
Twelfth New York.....	21	20	4.08	13.89
Second Missouri.....	20	19	7.09	10.49
First New Hampshire.....	32	30	10.10	14.08
Ninth Pennsylvania.....	27	25	7.48	16.12

Eleven regiments in the first group lost from all causes. 315
 These 11 regiments had an aggregate strength when they left Chickamauga of 13,814
 The percentage of deaths from all causes in the 11 regiments that left Chickamauga early 2.28
 The 16 regiments in the second group lost from all causes. 314
 These 16 regiments had an aggregate strength when they left Chickamauga of 20,361
 The percentage of deaths from all causes in the 16 regiments of the second group, which left Chickamauga later, is. 1.54

It will be seen from these figures that so far as loss by deaths from all causes goes these two groups did not differ much, the loss being slightly greater in the regiments that left Chickamauga early.

The 11 regiments in the first group lost by death from typhoid fever 209
 The percentage of deaths from typhoid fever in the 11 regiments that left Chickamauga early 1.5
 The 16 regiments in the second group lost by deaths from typhoid fever 272
 The percentage of deaths from typhoid fever in the 16 regiments that remained longer at Chickamauga. 1.33

It will be seen from these figures that while there is a marked difference in the percentage of total deaths in these two groups the percentages of deaths from typhoid fever differ less.

Seven regiments out of the first group had among the probable cases of typhoid fever a death rate of 5.86 per cent.

Sixteen regiments in the second group had among the probable cases of typhoid fever a death rate of 5.81 per cent.

These figures, in our opinion, furnish additional evidence to our claim that we have not overestimated the number of cases of typhoid.

We will next inquire whether or not the regiments

that went to Porto Rico suffered more severely by deaths from all causes than did the regiments that remained in this country. The following figures bear upon this inquiry:

The seven regiments of this corps that went to Porto Rico had a total loss by death of 251. The aggregate strength of these regiments on leaving Chickamauga was 8,750.

The percentage of deaths from all causes among the regiments that went to Porto Rico was 2.86.

The percentage of deaths from all causes among the regiments that remained at Chickamauga was 1.49.

It will be seen from these figures that the loss of life was increased by sending these troops to Porto Rico.

The following table gives figures showing the most important facts concerning typhoid fever in the First Army Corps:

FIRST DIVISION.

Brigade and regiment.	Date of first case.	Total number of cases.	Number of recognized cases.	Total deaths.	Deaths from typhoid.	Per cent of deaths among probable cases.	Per cent of deaths among recognized cases.
<i>First Brigade.</i>							
First Kentucky <i>a</i>	June 19	262	88	28	18	6.87	20.45
Third Wisconsin <i>a</i>	May 24	378	107	36	25	6.61	23.36
Fifth Illinois.....	May 16	125	113	16	8	6.40	7.08
<i>Second Brigade.</i>							
Fourth Ohio <i>a</i>	May 17	.....	.....	26	19	.....	.....
Third Illinois <i>a</i>.....	.....do.....	546	149	44	25	4.57	16.77
Fourth Pennsylvania <i>a</i>	June 1	.....	.....	35	24	.....	.....
<i>Third Brigade.</i>							
Sixteenth Pennsylvania <i>a</i>	May 8	.....	.....	41	34	.....	.....
Second Wisconsin <i>a</i>	May 11	329	113	41	27	8.20	23.89
Third Kentucky.....	June 9	219	.....	17	11	5.02	.....

a These regiments went to Porto Rico.

SECOND DIVISION.

<i>First Brigade.</i>							
Thirty-first Michigan.....	June 1	239	86	27	16	6.69	18.60
One hundred and sixtieth Indiana.....	July 4	223	47	11	8	3.58	17.02
First Georgia.....	June 6	120	36	10	9	7.50	25
<i>Second Brigade.</i>							
One hundred and fifty-eighth Indiana.....	June 6	128	49	12	10	7.81	20.40
Sixth Ohio.....	May 18	291	148	21	19	6.52	12.83
First West Virginia.....	June 6	260	106	15	12	4.61	11.32
<i>Third Brigade.</i>							
First Pennsylvania.....	May 12	222	169	14	12	5.40	7.10
Fourteenth Minnesota.....	May 27	286	146	13	12	4.19	8.21
Second Ohio.....	May 20	403	192	14	13	3.22	6.77

THIRD DIVISION.

<i>First Brigade.</i>							
Fifth Pennsylvania.....	May 19	338	152	16	16	4.73	10.52
Twelfth Minnesota.....	May 20	433	144	19	19	4.38	13.19
First South Carolina.....	.....	.....	.....	20	10	.....	.....
<i>Second Brigade.</i>							
Eighth Massachusetts.....	May 28	272	157	30	19	6.98	12.10
Twenty-first Kansas.....	May 21	294	95	23	21	7.14	22.10
Twelfth New York.....	June 6	490	144	21	20	4.08	13.89
<i>Third Brigade.</i>							
Second Missouri.....	May 26	268	181	20	19	7.09	10.49
First New Hampshire.....	May 24	297	213	32	30	10.10	14.08
Ninth Pennsylvania.....	May 31	334	155	27	25	7.48	16.12

The total number of cases of probable typhoid fever in this corps, excluding the 7 regiments that went to Porto Rico, and the First South Carolina, is	5,242
The aggregate strength of these 19 regiments was	24,262
The percentage of typhoid fever among these 19 regiments was	21.62
The total number of deaths from typhoid fever in these 19 regiments was	299
The percentage of deaths among probable cases of typhoid fever was	5.70

This percentage is too low, for two reasons—first, it is certain that we have not been able to obtain a complete list of deaths; second, in the list of deaths as we have given it, several cases attributed to other causes were undoubtedly due to typhoid fever.

In these 19 regiments the number of recognized cases of typhoid fever was	2,384
The percentage of deaths among recognized cases of typhoid fever was	12.54

Of course this last statement can not be correct, because all the deaths from typhoid fever did not occur among the recognized cases. From these figures we have no hesitancy in concluding that our list of probable typhoid fevers more nearly represents the actual number than does the list of recognized cases.

In this tabular statement of the First Army Corps are included seven regiments of the First Division, which started early for Porto Rico, and the First South Carolina Regiment (Third Division). The records of these eight regiments are very incomplete, and they have therefore been omitted from the general summary of the statistics of the board on the next page.

Summary of deaths in the First Army Corps.

FIRST DIVISION.	
Total deaths	284
Deaths due to typhoid fever	204
Percentage of deaths from typhoid to total deaths	71.837
SECOND DIVISION.	
Total deaths	137
Deaths due to typhoid fever	111
Percentage of deaths from typhoid to total deaths	81.02
THIRD DIVISION.	
Total deaths	208
Deaths due to typhoid fever	179
Percentage of deaths from typhoid to total deaths	86.06
Total deaths in the First Army Corps	629
Deaths due to typhoid fever in the First Army Corps	494
Percentage of deaths from typhoid to total deaths in the First Army Corps	78.53

Table showing for certain regiments of the First Army Corps assembled at Chickamauga the mortality and morbidity from typhoid fever.

Regiments.	Mean strength.	Cases of typhoid fever.		Deaths from typhoid fever.	Deaths from all diseases.	Deaths from typhoid fever in 100 cases of—		Percentage of deaths from typhoid to all diseases.	Morbidity of typhoid fever in 1,000 mean strength.		Deaths from typhoid fever in 1,000 of mean strength.
		Certain.	Certain and probable.			Certain typhoid.	Certain and probable.		For certain cases of typhoid.	For certain and probable cases of typhoid.	
<i>First Division, First Army Corps:</i>											
Fifth Illinois	1,296	113	125	8	16	7.08	6.40	50.00	87.19	96.45	6.17
Third Kentucky	1,293	51	219	11	17	21.57	5.02	64.70	39.44	169.37	8.50
Total	2,589	164	344	19	33	11.59	5.52	57.57	63.34	132.86	7.33
<i>Second Division, First Army Corps:</i>											
Thirty-first Michigan	1,290	86	239	16	27	18.60	6.69	59.26	66.66	185.27	12.40
One hundred and sixtieth Indiana	1,312	47	223	8	11	17.02	3.58	72.72	35.82	169.96	6.09
First Georgia	1,212	36	120	9	10	25.00	7.50	90.00	29.70	99.00	7.42
One hundred and fifty-eighth Indiana	1,288	49	128	10	12	20.40	7.81	83.33	38.04	99.37	7.76
Sixth Ohio	1,299	148	291	19	21	12.83	6.52	90.48	113.93	224.01	14.62
First West Virginia	1,298	106	260	12	15	11.32	4.61	80.00	81.66	200.30	9.24
First Pennsylvania	1,071	169	222	12	14	7.10	5.40	85.71	157.79	207.28	11.20
Fourteenth Minnesota	1,277	146	286	12	13	8.21	4.19	92.30	114.33	223.96	9.39
Second Ohio	1,297	192	403	13	14	6.77	3.22	92.86	148.03	310.71	10.02
Total	11,344	979	2,172	111	137	11.34	5.11	81.02	86.30	191.46	9.78
<i>Third Division, First Army Corps:</i>											
Fifth Pennsylvania	1,291	152	338	16	16	10.52	4.73	100.00	117.73	261.81	12.39
Twelfth Minnesota	1,299	144	433	19	19	13.19	4.38	100.00	110.85	333.32	14.64
Eighth Massachusetts	1,317	157	272	19	30	12.10	6.98	63.33	119.21	206.53	14.42
Twenty-first Kansas	1,264	95	294	21	23	22.10	7.14	91.30	75.15	232.59	16.61
Twelfth New York	1,302	144	490	20	21	13.89	4.08	95.24	110.59	376.34	15.36
Second Missouri	1,269	181	268	19	20	10.49	7.09	95.00	142.63	211.18	14.97
First New Hampshire	1,296	213	297	30	32	14.08	10.10	93.75	164.35	229.16	23.15
Ninth Pennsylvania	1,291	155	334	25	27	16.12	7.48	92.59	120.06	258.71	19.36
Total	10,329	1,241	2,726	169	188	13.62	6.20	89.89	120.14	263.91	16.36
<i>Cavalry Brigade, First Army Corps:</i>											
Third United States Volunteer Cavalry	1,013	103	270	13	15	12.62	4.81	86.67	101.67	266.53	12.83
First Illinois Cavalry	1,299	68	220	16	17	23.53	7.27	94.12	52.34	169.36	12.31
First Ohio Volunteer Cavalry	833	77	189	7	7	9.09	3.70	100.00	92.44	226.88	8.40
Total	3,145	248	679	36	39	14.51	5.30	92.31	78.85	215.89	11.44
Total, First Army Corps	27,407	2,632	5,921	335	397	12.72	5.66	84.38	96.03	216.04	12.22

CHAPTER IV.

TYPHOID FEVER IN THE FIRST DIVISION OF THE THIRD ARMY CORPS.

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THIRD ARMY CORPS.

FIRST DIVISION.

Brigade and regiment.	Arrived at Chickamauga.	Strength on arrival.	Left Chickamauga.	Strength on leaving.	No. of cases developed at Chickamauga.	No. of cases developed after leaving Chickamauga.
<i>First Brigade.</i>						
Fourteenth New York.....	May 20	913	Sept. 3	1,277	200	33
First Missouri.....	May 21	1,021	Sept. 4	1,275	158	58
Fifth Maryland.....	do	979	June 2	985	0	250
<i>Second Brigade.</i>						
Second Nebraska.....	May 22	1,020	Aug. 31	1,303	167	0
Second New York.....	May 21	1,078	June 1	1,014	1	160
First District of Columbia.....	May 23		do	942		
<i>Third Brigade.</i>						
Third Tennessee.....	May 24	997	Sept. 5	1,293	106	17
First Vermont.....	do	1,026	Aug. 18	996	220	58
Eighth New York.....	May 25	819	Sept. 6	1,301	390	35

SECOND DIVISION.

<i>First Brigade.</i>						
Second Kentucky.....	May 26	982	Sept. 12	1,332	277	9
Ninth New York.....	do	1,025	Sept. 14	1,292	323	0
First Arkansas.....	May 27	1,190	Sept. 8	1,290	224	4
<i>Second Brigade.</i>						
Fifth Missouri.....	May 27	1,024	Aug. 27	1,274	153	59
Second Arkansas.....	May 30	1,029	Sept. 9	1,291	238	49
Sixty-ninth New York.....	May 27	1,036	June 2	1,026	0	299
<i>Third Brigade.</i>						
First Maine.....	May 30	1,002	Aug. 23	1,286	150	38
Fifty-second Iowa.....	May 31	572	Aug. 28	1,304	257	88
First Mississippi.....	do	995	Sept. 8	1,029	388	9

FOURTEENTH NEW YORK VOLUNTEER INFANTRY.

First Brigade, First Division, Third Army Corps.

In the May report Maj. John Macumber in charge makes the following statement:

This regiment, formerly the Fourteenth, National Guard, New York, was mustered into the United States service at Camp Black, Hempstead, Long Island—the first battalion May 13, 1898, and the

second and third May 18, 1898. It proceeded thence by rail to Chickamauga Park, Ga., and arrived May 20, 1898. The camp at Chickamauga is located on a narrow strip of woodland running northwest by southeast. It occupies a ridge near Chickamauga Creek. The ground consists of a thin covering of soil—clay and sand—resting on a bed of rock. There is not enough soil in places to hold the tent pegs. The sloping nature of the ground gives good surface drainage, but the rock beneath forms a basin which prevents subsoil drainage. The prevailing conditions requiring treatment are heat prostrations and diarrhea, the one frequently complicating the other. The use of liquor sometimes acts as a predisposing cause of heat prostration, though as a rule the men are very temperate. The water is of poor quality and of insufficient quantity. Enough containers, boilers, and buckets are not furnished to make it practicable to supply the men with boiled water, which is very essential. The food is of good quality and of sufficient quantity, though too much salt pork and too little fresh meat has been issued. The men are just now learning how to prepare the food furnished so as to make the most of it. Two cases of pneumonia, now convalescent, are the only serious cases of illness. Eight or ten men, by misrepresentation, passed the medical examination and have been since found unfit for duty. These will be recommended for discharge. They are epileptics and syphilitics.

CONDENSED SICK REPORT FROM MAY 13 TO 31, INCLUSIVE.

Mean strength.....	913
Diarrhea.....	28
Remittent malaria.....	1
Other diseases.....	50
Total.....	79

There is no case of diarrhea here reported in the list of completed cases that lasted more than two days. Among the incomplete cases several were admitted after May 25 and remained in hospital May 31. These will probably appear in the June report.

The June report is signed by Arthur H. Bogart, who makes the following statement:

The prevailing diseases during the month have been those involving the intestinal tract—diarrhea and typhoid fever. Four cases of the latter have been developed, probably as a result of the carelessness on the part of the men in drinking water which had

not been boiled. Orders have been issued condemning this practice and are being rigidly enforced. The sanitary conditions have been carefully watched. No other source of infection has been found. The cases of diarrhea have, as a rule, been mild and have responded promptly to treatment.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1, 159
Diarrhea.....	142
Remittent malaria.....	10
Intermittent malaria.....	2
Malarial fever.....	3
Typhoid fever.....	2
Dysentery.....	1
Other diseases.....	80
Total	240

It will be observed that the surgeon states in his comments that there are four cases of recognized typhoid fever. Only two occur so diagnosed in the report; these are as follows:

Private W. E., of Company I: June 19 to 27. This man's illness began much earlier than is indicated by the above figures. He is recorded as having had diarrhea from June 12 to 14, and diarrhea again June 18 and 19. According to this, admission to the sick report should be June 12. The second case is that of a private, E. C., of Company A, who was taken sick June 14 and sent to hospital June 30. This man's illness also began earlier than is indicated. He had diarrhea from June 12 to 14. On the latter date he was returned to duty and on the next day reported sick with typhoid fever. This brings the initial date in this case also to June 12.

The July report is signed by Captain Bogart. It contains the following statement:

The prevailing diseases in this command during the month have been diarrhea, rheumatism, malaria, bronchitis, and an occasional case of typhoid fever. The diarrheal cases were most common during the early part of the month and were probably due to the quality of the water, which has been much improved by the use of the filters recently furnished, and also by boiling. Malaria has been more common during the last ten days, and is undoubtedly due to the fact that the men are sleeping on the damp ground. This also has caused bronchitis and rheumatism. An attempt has been made to procure board floors or other suitable material in order to prevent a continuation of these diseases. The cases of typhoid fever have been numerous, and the source of infection is not easily traced. Possibly it may be due to the habit that the men have of drinking from springs wherever they may be found. This practice has been strenuously forbidden and all springs filled.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1, 310
Diarrhea.....	49
Typhoid fever.....	15
Intermittent malaria.....	67
Remittent malaria.....	28
Acute dyspepsia.....	5
Enteritis.....	1
Dysentery.....	1
Gastro-enteritis.....	1
Other diseases.....	69
Total	236

The August report bears no comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1, 276
Typhoid fever.....	26
Diarrhea.....	44
Remittent malaria.....	41
Intermittent malaria.....	466
Dysentery.....	1
Gastro-enteritis.....	1
Acute gastritis.....	2
Acute dyspepsia.....	3
Malarial fever.....	1
Other diseases.....	63
Total	648

September 3, 1898, this regiment left Chickamauga Park and proceeded to Brooklyn, N. Y., where it was disbanded.

The last report covers the period from September 1 to 14. This report is signed by Major Bogart without comment.

CONDENSED SICK REPORT FROM SEPTEMBER 1 TO 14.

Mean strength.....	1, 257
Malaria.....	198
Typhoid fever.....	9
Diarrhea.....	7
Other diseases.....	10
Total	224

We will not give a list of the probable cases of typhoid fever, but will content ourselves with a summary.

We find in the records of this regiment, together with those of the hospitals to which the sick from the regiment were sent, the names of 233 individuals who had protracted fever. These were diagnosed as follows:

Typhoid fever.....	95
Diarrhea.....	5
Dysentery.....	1
Malaria.....	132
Total	233

It must not be understood that 95 cases were diagnosed as typhoid fever in the regimental records, but we find this number with a diagnosis of typhoid fever in either the regimental or hospital record.

SUMMARY.

Assembled at Camp Black, Hempstead, Long Island, in April, 1898.

Mustered into United States service, May 13, 1898.

Arrived at Chickamauga Park, Ga., May 20, 1898.

Strength on arrival, 913.

Date of first case of probable typhoid fever, May 23, 1898.

Date of first case of recognized typhoid fever, June 12, 1898.

Left Chickamauga Park, Ga., September 3, 1898.

Strength on departure, 1,277.

Number of cases of probable typhoid fever developed at Chickamauga

Went from Chickamauga Park to Brooklyn, N. Y., and there disbanded.

Number of cases of probable typhoid fever developed after leaving Chickamauga Park..... 33

Total number of cases of probable typhoid fever developed in the Fourteenth New York Volunteer Infantry from May to September, 1898..... 233

These 233 cases were diagnosed as follows:

Typhoid fever..... 95
Malaria..... 132
Diarrhea..... 5
Dysentery..... 1

Total..... 233

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bertholf, Clarence S.	Pvt., A.	1898. Nov. 4	Brooklyn, N. Y.	Tuberculosis pulmonalis, empyema, inanition, acute diffuse nephritis.
Borton, Alfred M.	Hosp. st.	Sept. 18	Anniston, Ala.	Typhoid.
Briarty, Fred	Pvt., (?)	Sept. 14	New York, N. Y.	Do.
Brown, Emanuel	Pvt., A.	Sept. 28	First Division hospital, Anniston, Ala.	Do.
Chevalier, Andrea	Pvt., M.	Sept. 17	Sternberg General Hospital, Chickamauga, Ga.	Do.
Clark, Edward P.	Pvt., A.	July 5	First Division, Third Army Corps, hospital, Camp Thomas, Ga.	Do.
Cooney, James J.	Pvt., I.	Sept. 3	Sternberg General Hospital, Chickamauga, Ga.	Do.
Fricke, Conrad, jr.	Pvt., M.	Oct. 13	Brooklyn, N. Y.	Do.
Hall, Emil	Pvt., G.	Oct. 14	Brooklyn Hospital, Brooklyn, N. Y.	Do.
Hayden, Erick	Pvt., G.	Aug. 15	Chickamauga, Ga.	Do.
Hayes, William	Pvt., E.	Sept. 16	Division hospital, Anniston, Ala.	Do.
Joyce, Barrington	Pvt., I.	Aug. 11	Chickamauga Park, Ga.	Do.
Kirk, Charles T.	Mus., B.	Sept. 15	Chickamauga Park, Ga.	Do.
Kurz, Emil R.	Pvt., B.	Sept. 28	Long Island College Hospital, Brooklyn, N. Y.	Malaria.
Layton, Geo. S.	Quasgt., B.	Sept. 20	Brooklyn, N. Y.	Typhoid.
McCoy, Charles E.	Pvt., I.	Oct. 15	do	do
McDonough, W. J.	Pvt., M.	Sept. 20	Brooklyn Hospital, Brooklyn, N. Y.	Malaria.
Mackey, Herbert E.	Pvt., H.	Nov. 2	St. Mary's Hospital, Brooklyn, N. Y.	Phthisis.
Mahoney, Henry C.	Corpl., F.	Sept. 21	Anniston, Ala.	Typhoid.
Martin, James C.	Pvt., K.	Aug. 11	Chickamauga, Ga.	Cardiac asthma.
Nelson, Charles	Pvt., G.	Oct. 27	Camp Thomas, Ga.	Typhoid.
O'Neill, Thomas E.	Pvt., E.	Nov. 6	St. Peter's Hospital, Brooklyn, N. Y.	Do.
Platts, W. G.	Pvt., C.	Sept. 5	Anniston, Ala.	Spinal meningitis.
Quarty, Fred	Pvt., L.	Sept. 24	General hospital, New York.	Typhoid.
Reed, Oscar	Artif., G.	do	Anniston, Ala.	Do.
Rickle, W. H.	Corpl., K.	Sept. 30	Chickamauga, Ga.	Do.
Ryan, Patrick	(?), F.	Sept. 3	Brooklyn, N. Y.	Do.
Scriven, Fred	Pvt., L.	Sept. 6	Chickamauga, Ga.	Peritonitis.
Smith, Stanley A.	Corpl., K.	Sept. 22	Camp Shipp, Ala., field hospital, First Division, Third Army Corps.	Typhoid pneumonia.
Weismantel, Joseph	Pvt., C.	Sept. 7	Anniston, Ala.	Typhoid.
Witz, Anton, jr.	Pvt., I.	Sept. 25	Chickamauga, Ga.	Do.

Total deaths..... 31

Deaths from typhoid fever..... 24

Percentage of deaths among probable cases of typhoid fever (233), 10.30.

Percentage of deaths among recognized cases of typhoid fever (95), 25.26.

It is more than probable that the cases in the above list in which cause of death is not given were due to typhoid fever. It will be seen from this that the probabilities are that in our list of probable cases we have not included all actual cases of typhoid fever.

COMMUNICATIONS FROM THE SURGEONS OF THE FOURTEENTH NEW YORK VOLUNTEER INFANTRY.

Medical officers.

Arthur Bogart, major and surgeon, Brooklyn, N. Y.

Thomas B. Spruce, captain and assistant surgeon, Brooklyn, N. Y.

Under date of July 13, 1899, Major Bogart makes the following statement:

The name of Private Fred Briarty, who died September 14, 1898, of typhoid fever at the German Hospital, New York, should be added to the list of deaths.

From Chickamauga Park the regiment was ordered to Anniston, Ala., on September 3, arriving there on the morning of the 4th, where it camped until September 14, when it was ordered home to Brooklyn, arriving there September 16, and was mustered out of service October 27, 1898.

It is evident, from your summary, that the number of typhoid cases has been very much overestimated. It can not be supposed that every case of protracted fever contracted in the Southern camps was typhoid; moreover, all of these cases were observed by a number of men both competent and anxious to arrive at correct conclusions regarding their nature, and the diagnosis as found in the regimental reports were confirmed at the division hospital before the reports were sent forward. There was, without any doubt, a great deal of malaria in the Southern camps. I do not know that I can add anything more of value to the report. Regarding the sanitary conditions of the camps, I have but little to say other than that they were not what they should have been at Chickamauga, while at Anniston they were excellent.

Comment: With the additional death given by Major Bogart, the percentage of deaths among the number of cases of probable typhoid fever reaches 10.30. We are quite confident that a death rate of more than 10 per cent proves beyond peradventure that we have not overestimated the number of cases of typhoid fever in this regiment.

FIRST MISSOURI VOLUNTEER INFANTRY.

First Brigade, First Division, Third Army Corps.

In the May report, Lieutenant Welch, in charge, makes the following statement:

The regiment was mustered into the service May 13 at Jefferson Barracks, Mo., and left on May 18 for Chickamauga, arriving at the latter place May 21. When the command was en route from Jefferson Barracks to Chickamauga it suffered a railroad collision at Rossville, Ga., in which Artificer George M. Walker, of Company D, was killed from compound fracture of skull; Private Alfred McLean, of Company M, suffered a dislocation of left femur at hip joint; Private Howard Erolaski, of Company B, had a fracture of articular cartilage at left hip joint; Private Lavanberg, of Company A, suffered from multi-contusions of the trunk; Private Richard Sidel, Company H, had a severe sprain of back, and First Lieutenant Richards a lacerated wound of left thumb. These patients were taken to St. Vincent's Hospital, Chattanooga, Tenn., for treatment. They are recovering. The general health of the command has been exceedingly good. The most common illness has been acute diarrhea, which in the main was easily relieved by simple remedies.

CONDENSED SICK REPORT FROM MAY 13 TO MAY 31, INCLUSIVE.

Mean strength	1,021
Diarrhea	43
Intermittent malaria	2
Other diseases and accidents	30
Total	75

All of the diarrheas in this report were of less than three days' duration, and there is no evidence in this record of the existence of typhoid fever in the regiment at this time.

In the June report Lieutenant Welch makes the following statement:

The camp is in excellent condition, clean, well policed and drained.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,328
Diarrhea	105
Dysentery	3
Intermittent malaria	38
Acute enteritis	3
Typhoid fever	1
Other diseases and accidents	69
Total	219

The recognized case of typhoid fever was that of a private in Company B. The initial date of the illness in this case is given as June 28. In the July report Lieutenant Welch states:

The general health of the command has been good. While the percentage of sick was rather high, still the great majority of the cases treated yielded promptly to treatment, and the men were soon returned to duty. There has been a decided decrease in the number of cases of acute diarrhea. I think this is in the main due to the fact that the men are becoming more accustomed to camp life and that the drinking water is being filtered and boiled to a great extent. A few cases of typhoid fever developed previous to the boiling of the drinking water. Since the boiling of the water, I apprehend little trouble from typhoid fever. The prevalence of malarial fever is due to the region and latitude of Camp Thomas, to the nonacclimatization of most of the soldiers, to the rainy weather, and to the season of the year.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,311
Typhoid fever	3
Diarrhea	89
Intermittent malaria	53
Remittent malaria	59
Enteritis	2
Dysentery	5
Other diseases	141
Total	352

Of the three recognized cases of typhoid fever, one was brought over from the June report. The others were sent to Leiter Hospital.

A detachment, consisting of Companies D, H, I, and M of this regiment, numbering 489 men, seems to have

been separated from the rest of the regiment during the entire month of July. This detachment gives the following list:

Intermittent malaria	6
Continued malaria	1
Diarrhea	11
Enteritis	5
Other diseases	10
Total	33

The case of continued malaria was that of a private in Company M, and his name first occurs on sick report July 29.

In the August report Lieutenant Welch makes the following statement:

The most prevalent disease was malarial remittent fever. This was due in the main to nonacclimatization of the men, the wet weather, and the leaky condition of a great many tents and the crowding of six men in a tent. We have had a few cases of typhoid fever. I can not account for them unless the men drank some water that had not been boiled. To prevent the malarial fever, I gave large doses of quinine to all of the men in the regiment; the drinking water was boiled to prevent typhoid fever.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,275
Diarrhea	76
Typhoid fever	5
Remittent malaria	125
Intermittent malaria	27
Dysentery	10
Enteritis	2
Other diseases	151
Total	396

Of the recognized cases of typhoid fever in this report four had their initial date in July and the fifth on August 3.

In the September report Lieutenant Welch makes the following statement:

From September 1 to 4 this regiment was encamped at Chickamauga, and on the latter day it left this place for Jefferson Barracks, Mo. On September 10 the regiment was furloughed with the exception of a guard of 60 men, the furlough to expire October 10. The main prevalent disease has been malarial fever. A great many cases developed shortly after our arrival at Jefferson Barracks. Most of these men were sent to City Hospital at St. Louis and to their homes. The health of that part of the regiment remaining in camp has been very good.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,262
Typhoid fever	3
Intermittent malaria	18
Remittent malaria	119
Diarrhea	28
Dysentery	4
Other diseases	37
Total	209

Of the three recognized cases of typhoid fever two are brought over from the August report and the third had its initial date September 6.

The following is a list of the probable cases of typhoid fever in this regiment:

- No. 1. Diarrhea, May 31 to June 12.
- No. 2. Enteritis, June 1; sent to Leiter Hospital June 15. Here the diagnosis was changed to intermittent malaria, and the patient was furloughed July 11.
- No. 3. Enteritis, June 2 to 19.
- No. 4. Diarrhea, June 7 to 18.
- No. 5. Dysentery, June 10 to 22.
- No. 6. Diarrhea, June 12; still sick July 31. There is no further record of this patient.
- No. 7. Diarrhea, June 18 to July 19.
- No. 8. Typhoid fever, June 28; discharged August 25. This man had diarrhea May 18 to 20.
- No. 9. Enteritis, July 7 to 25. This man had dysentery June 23 to 27.
- No. 10. Intermittent malaria, July 7; sent to division hospital July 31. Here the diagnosis was changed to typhoid fever, and the patient is recorded as having been returned to duty August 8.
- No. 11. Remittent malaria, July 8 to 18.
- No. 12. Intermittent malaria, July 8 to 24.
- No. 13. Intermittent malaria, July 9; still sick July 31. There is no further record of this case.
- No. 14. Dysentery, July 11 to 24.
- No. 15. Intermittent malaria, July 19; furloughed August 11.
- No. 16. Typhoid fever, July 19; furloughed August 30.
- No. 17. Intermittent malaria, July 19; sent to Sternberg Hospital August 31. Here the diagnosis was changed to continued malaria, and the patient was furloughed October 4.
- No. 18. Intermittent malaria, July 20; still sick in division hospital August 31.
- No. 19. Typhoid fever, July 22; furloughed August 31.
- No. 20. Intermittent malaria, July 22 to August 21.
- No. 21. Intermittent malaria, July 23 to August 23.
- No. 22. Intermittent malaria, July 23 to August 31. This man had diarrhea, May 26 to 29.
- No. 23. Typhoid fever, July 24; died August 15. This man had diarrhea, June 15 and 16.
- No. 24. Remittent malaria, July 24 to September 30.
- No. 25. Malaria, July 26 to September 25. This man had diarrhea, June 1 to 3.
- No. 26. Remittent malaria, July 26; furloughed August 25.
- No. 27. Intermittent malaria, July 27; sent to Leiter Hospital July 28. Here the diagnosis was changed to continued malaria and the patient was returned to duty September 17.
- No. 28. Intermittent malaria, July 27; sent to division hospital August 12. Here the diagnosis was changed to typhoid fever, and the disposition of the patient is not given. This man had diarrhea, July 18 to 20.
- No. 29. Remittent malaria, July 27 to August 21.
- No. 30. Intermittent malaria, July 27; furloughed August 12.
- No. 31. Intermittent malaria, July 27 to September 8.
- No. 32. Typhoid fever, July 28; disposition not given. This is probably not the correct initial date of this case, because we find him registered in the report as having had diarrhea, from July 8 to August 7. It is probable that the initial date of the typhoid fever should be July 8.
- No. 33. Diarrhea, July 30 to September 26.
- No. 34a. Malaria, July 20; still sick August 31.
- No. 34. Typhoid fever, July 31 to September 22.
- No. 35. Malaria, August 1 to September 27.
- No. 36. Remittent malaria, August 2 to September 24.
- No. 37. Dysentery, August 2; still sick in Leiter Hospital August 31. This man had dysentery, July 21 to 26.
- No. 38. Malaria, August 2 to September 26.

- No. 39. Intermittent malaria, August 2 to September 24.
- No. 40. Malaria, August 2 to 20.
- No. 41. Typhoid fever, August 3. Disposition not given.
- No. 42. Dysentery, August 4 to September 25. This man had diarrhea, July 13 to 17. Diarrhea, July 20; left incomplete.
- No. 43. Remittent malaria, August 4 to 16.
- No. 44. Intermittent malaria, August 5; furloughed August 26.
- No. 45. Intermittent malaria, August 5; sent to Leiter Hospital August 28. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 24.
- No. 46. Remittent malaria, August 7 to 26.
- No. 47. Remittent malaria, August 7 to September 23.
- No. 48. Remittent malaria, August 8 to September 23.
- No. 49. Intermittent malaria, August 8; died September 1.
- No. 50. Remittent malaria, August 9; sent to division hospital August 10. Here the diagnosis was changed to diarrhea, and the patient was furloughed August 23.
- No. 51. Diarrhea, August 9 to September 26. This is probably not the correct initial date for this case, as elsewhere in the record he is registered as having diarrhea from June 11 to September 26.
- No. 52. Intermittent malaria, August 11; sent to Leiter Hospital August 25. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 22.
- No. 53. Malaria, August 11; furloughed August 23.
- No. 54. Remittent malaria, August 11 to September 25.
- No. 55. Diarrhea, August 14 to September 24.
- No. 56. Dysentery, August 14 to September 29.
- No. 57. Remittent malaria, August 14 to September 24.
- No. 58. Malaria, without date; sent to Sternberg Hospital August 14. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 2.
- No. 59. Malaria, without date; sent to Sternberg Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 25.
- No. 60. Malaria, without date; sent to Sternberg Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 28.
- No. 61. Malaria, without date; sent to Sternberg Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 20.
- No. 62. Malaria, without date; sent to Sternberg Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 29.
- No. 63. Malaria, without date; sent to Sternberg Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient died August 31. On the regimental record this man is registered as having had remittent malaria from July 28 to 31.
- No. 64. Malaria, without date; sent to Sternberg Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 4.
- No. 65. Malaria, without date; sent to Leiter Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient died August 16.
- No. 66. Malaria, without date; sent to Leiter Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 30.
- No. 67. Malaria, without date; sent to Sternberg Hospital August 15. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 4. It is quite evident from this record that several of the more serious malarials which had accumulated on the regiments were taken to the hospitals on August 15, and were there recognized as cases of typhoid fever.
- No. 68. Remittent malaria, August 16 to September 26. Elsewhere in the record this man is registered as having suffered from malaria from June 11 to September 26.
- No. 69. Malaria, without date; sent to Sternberg Hospital, August 17. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 25.

No. 70. Diarrhea, August 17 to September 24. Elsewhere this man is registered as having had diarrhea from August 14 to September 24.

No. 71. Intermittent malaria, August 17 to September 26.

No. 72. Malaria, without date; sent to Sternberg Hospital, August 17. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 25.

No. 73. Remittent malaria, August 18 to September 24.

No. 74. Intermittent malaria, August 18 to September 8.

No. 75. Remittent malaria, August 19; still sick September 30.

No. 76. Malaria, August 19 to September 28. This man had diarrhea, May 26 to 28.

No. 77. Typhoid fever, August 19; sent to Sternberg Hospital August 30.

No. 78. Malaria, without date; sent to Sternberg Hospital August 20. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 25.

No. 79. Remittent malaria, August 20 to September 23.

No. 80. Remittent malaria, August 20; still sick September 30.

No. 81. Intermittent malaria, August 20 to September 24.

No. 82. Malaria, August 20 to September 24. Elsewhere this man is recorded as having had diarrhea, August 29 to September 29.

No. 83. Remittent malaria, August 20; sent to Leiter Hospital August 23. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 7.

No. 84. Remittent malaria, August 20; furloughed September 8.

No. 85. Malaria, without date; sent to Sternberg Hospital August 20. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 10. This man had diarrhea, July 6 and 7.

No. 86. Remittent malaria, August 21; sent to Sternberg Hospital August 30. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 21.

No. 87. Intermittent malaria, August 21 to September 8.

No. 88. Malaria, August 22 to September 23.

No. 89. Malaria, August 22 to September 24.

No. 90. Intermittent malaria, August 22; still sick September 30. This man had diarrhea, May 28 to 30; diarrhea, June 6 to 9.

No. 91. Malaria, August 22 to September 28.

No. 92. Malaria, August 22 to September 20. This man had remittent malaria, August 12 to 15.

No. 93. Intermittent malaria, August 22 to September 29. This man had diarrhea, June 22 and 23; intermittent malaria, June 20 to July 3; diarrhea, July 20 and 21.

No. 94. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to continued malaria, and the patient was furloughed October 4.

No. 95. Malaria, August 23 to September 26. Elsewhere this man is recorded as having had remittent malaria, August 19 to September 26.

No. 96. Malaria, August 23 to September 26.

No. 97. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 25.

No. 98. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 27.

No. 99. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 4.

No. 100. Malaria, August 23 to September 25. Elsewhere this man is registered as having had remittent malaria July 12 to September 25.

No. 101. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to continued malaria, and the patient was furloughed August 29.

No. 102. Malaria, August 23; furloughed September 8.

No. 103. Intermittent malaria, August 23 to September 24.

No. 104. Malaria, August 23 to September 24. Elsewhere this man is registered as having had diarrhea from August 14 to September 26.

No. 105. Malaria, August 23 to September 26. Elsewhere this man is registered as having had remittent malaria from August 18 to September 26.

No. 106. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to diarrhea, and the man was furloughed August 29.

No. 107. Diarrhea, August 23; furloughed September 8.

No. 108. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to typhoid fever, and the man was furloughed September 4.

No. 109. Malaria, without date; sent to Sternberg Hospital August 23. Here the diagnosis was changed to continued malaria, and the patient was furloughed August 29.

No. 110. Remittent malaria, August 24; sent to division hospital August 24. Here the diagnosis was changed to typhoid fever, and the patient was discharged September 27.

No. 111. Intermittent malaria, August 24; still sick September 30.

No. 112. Malaria, August 24 to September 26. This man had diarrhea July 10 to 14; diarrhea again August 17 to September 26. We would infer from this that the initial date of the typhoid fever in this case was August 17.

No. 113. Malaria, without date; sent to Sternberg Hospital August 24. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 4.

No. 114. Malaria, without date; sent to Sternberg Hospital August 24. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 6.

No. 115. Diarrhea, August 24 to September 30.

No. 116. Malaria, August 24 to September 30.

No. 117. Intermittent malaria, August 24 to September 30.

No. 118. Malaria, August 24; furloughed September 8. This man had diarrhea July 9 and 10; diarrhea, August 16 and 17.

No. 119. Malaria, August 25 to September 25. Elsewhere this man is recorded as having had diarrhea August 25 to September 25.

No. 120. Malaria, August 25; still sick September 30.

No. 121. Malaria, August 26 to September 6.

No. 122. Remittent malaria, August 26; still sick September 30.

No. 123. Malaria, August 26; furloughed September 7.

No. 124. Sent to Sternberg Hospital without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 25.

No. 125. Sent to Sternberg Hospital without diagnosis August 26. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 3. This man had diarrhea May 17 to 24.

No. 126. Sent to Sternberg Hospital without diagnosis August 26. Here the disease was diagnosed typhoid fever, and the patient died August 30.

No. 127. Intermittent malaria, August 26 to September 28. This man had remittent malaria August 10 to 19.

No. 128. Sent to Sternberg Hospital August 26 without diagnosis. Here the disease was diagnosed continued malaria, and the patient was furloughed September 4.

No. 129. Diarrhea, August 27 to September 24.

No. 130. Sent to Sternberg Hospital August 27 without diagnosis. Here the disease was diagnosed as remittent malaria, and the patient was furloughed September 4.

No. 131. Malaria, August 27 to September 28. This patient is also registered as having had remittent malaria from August 25 to September 28.

No. 132. Malaria, August 27; still sick September 30. This patient is also registered as having had diarrhea from July 9 to September 3.

No. 133. Sent to Sternberg Hospital August 27 without diagnosis. Here the case was registered as one of typhoid fever, and the

patient was furloughed September 27. This man is registered as having had diarrhea from July 3 to 25.

No. 134. Malaria, August 27 to September 28. This man had dysentery July 9 and 10.

No. 135. Sent to Sternberg Hospital August 27 without diagnosis. Here the patient is registered as having remittent malaria and was furloughed September 4.

No. 136. Malaria, without date; sent to Sternberg Hospital August 28. Here the disease was diagnosed continued malaria, and the patient was furloughed September 4. This man is reported as having had remittent malaria July 23 and 24.

No. 137. Malaria, without date; sent to Sternberg Hospital August 28. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 20. This man had diarrhea July 6 and 7.

No. 138. Malaria, without date; sent to Sternberg Hospital August 28. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 9.

No. 139. Malaria, without date; sent to Sternberg Hospital August 28. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 5.

No. 140. Malaria, without date; sent to Sternberg Hospital August 28; furloughed September 9.

No. 141. Malaria, August 28; furloughed September 15. This man is also recorded as having had diarrhea from August 3 to September 15.

No. 142. Remittent malarial, August 28; still sick September 30.

No. 143. Malaria; sent to Sternberg Hospital August 26. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 4.

No. 144. Remittent malaria, August 29; furloughed September 8.

No. 145. Malaria, August 29; still sick September 30. This man is also reported as having had diarrhea August 10 to September 8.

No. 146. Malaria, August 29 to September 28. This man is also recorded as having had diarrhea August 29 to September 28.

No. 147. Malaria, August 29 to September 23.

No. 148. Malaria, August 30; sent to Sternberg Hospital without date; furloughed September 23.

No. 149. Malaria, August 30 to September 18.

No. 150. Remittent malaria, August 31; still sick September 30.

No. 151. Malaria, without date; sent to Sternberg Hospital August 31. Here the disease was diagnosed as typhoid fever, and the patient was furloughed October 9.

No. 152. Malaria, without date; sent to Sternberg Hospital August 31. Here the disease was diagnosed as typhoid fever, and the patient was furloughed September 17.

No. 153. Malaria, without date; sent to Sternberg Hospital August 31; furloughed September 4.

No. 154. Malaria, September 2; sent to Sternberg Hospital on the same date. Here the disease was diagnosed as typhoid fever, and the patient was furloughed September 4.

No. 155. Malaria, September 2; sent to Sternberg Hospital September 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 3.

No. 156. Malaria, without date; sent to Sternberg Hospital September 2. Here the disease was diagnosed as typhoid fever, and the patient was furloughed November 7.

No. 157. Malaria, September 3; sent to Sternberg Hospital September 4. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 4.

No. 158. Malaria, without date; sent to Leiter Hospital September 3. Here the diagnosis was changed to typhoid fever and the patient was furloughed October 8.

No. 159. Typhoid fever, September 6; no disposition given.

No. 160. Malaria, September 8 to 26.

No. 161. Malaria, September 8 to 30.

No. 162. Malaria, September 8 to 26.

No. 163. Malaria, September 8 to 26.

No. 164. Malaria, September 8 to 26.

No. 165. Malaria, September 8 to 27.

No. 166. Malaria, September 8 to 27.

No. 167. Malaria, September 8; furloughed September 18.

No. 168. Malaria, September 8; furloughed September 19.

No. 169. Malaria, September 8 to 27.

No. 170. Malaria, September 8 to 28. Elsewhere this man is recorded as having had diarrhea from July 26 to September 28.

No. 171. Malaria, September 8 to 27.

No. 172. Malaria, September 8 to 28.

No. 173. Malaria, September 8 to 28.

No. 174. Malaria, September 8; furloughed September 16.

No. 175. Malaria, September 8; furloughed September 16.

No. 176. Malaria, September 8 to 27.

No. 177. Malaria, September 8; still sick September 30.

No. 178. Remittent malaria, September 8; furloughed September 19.

No. 179. Malaria, September 8; furloughed September 22.

No. 180. Malaria, September 8; still sick September 30.

No. 181. Malaria, September 8 to 26.

No. 182. Malaria, September 8 to 23.

No. 183. Malaria, September 8 to 27.

No. 184. Malaria, September 8; still sick September 30. This man had diarrhea July 26 to 28.

No. 185. Malaria, September 8 to 25.

No. 186. Malaria, September 8 to 29.

No. 187. Remittent malaria, September 8 to 24.

No. 188. Remittent malaria, September 8 to 19.

No. 189. Malaria, September 8 to 29.

No. 190. Malaria, September 8 to 23.

No. 191. Malaria, September 8 to 27. This man is also recorded as having had remittent malaria from August 16 to September 27.

No. 192. Malaria, September 8 to 26.

No. 193. Malaria, September 8 to 19.

No. 194. Malaria, September 8 to 26.

No. 195. Malaria, September 8 to 28.

No. 196. Malaria, September 8; still sick September 30.

No. 197. Malaria, September 8 to 28.

No. 198. Malaria, September 8 to 22.

No. 199. Remittent malaria, September 8 to 19.

No. 200. Remittent malaria, September 8 to 28.

No. 201. Remittent malaria, September 8 to 21. This man is also recorded as having had remittent malaria July 4 to September 28.

No. 202. Remittent malaria, September 8 to 18.

No. 203. Malaria, September 8 to 17.

No. 204. Malaria, September 8 to 28.

No. 205. Malaria, September 8 to 24.

No. 206. Malaria, September 8 to 27.

No. 207. Malaria, September 8 to 22.

No. 208. Malaria, September 8 to 28.

No. 209. Malaria, September 8 to 22.

No. 210. Malaria, September 11 to October 18.

No. 211. Malaria, September 14 to 23.

No. 212. Malaria, September 14 to October 17.

No. 213. Malaria, without date; sent to Fort McPherson September 16; returned to duty September 27.

No. 214. Remittent malaria, August 15 to September 15.

No. 215. Malaria, September 28 to October 12.

No. 216. Malaria, October 14 and 15.

SUMMARY.

Assembled at Jefferson Barracks, near St. Louis, Mo., in April, 1898.

Mustered into United States service May 13, 1898.

Arrived at Chickamauga Park, Ga., May 21, 1898.

Strength on arrival, 1,021.

Date of first case of probable typhoid fever, May 31, 1898.
 Date of first case of recognized typhoid fever, June 28, 1898.
 Left Chickamauga Park, Ga., September 4, 1898.
 Strength on leaving, 1,275.

Number of cases of probable typhoid fever developed at Chickamauga Park..... 158

Went from Chickamauga Park to Jefferson Barracks.
 Furloughed September 10, 1898.

Number of cases of probable typhoid fever developed after leaving Chickamauga Park..... 58

Total number of cases of probable typhoid fever developed in the First Missouri Volunteer Infantry from May to September..... 216

These 216 cases were diagnosed as follows:

Typhoid fever.....	46
Malaria.....	151
Diarrhea.....	13
Dysentery.....	4
Enteritis.....	2
Total.....	216

The following is an alphabetical list of all deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bronschweig, G. F....	Pvt., M.	1898. Aug. 16	Chickamauga, Ga.....	(Typhoid); peritonitis, perforation of bowels.
Ernst, Oscar F.....	Pvt., H.	Aug. 31	Sternberg United States Field Hospital.	Typhoid.
Gant, Harley C.....	Artif., A.	Aug. 13	Chickamauga, Ga.....	(Typhoid); dysentery.
Henley, Thomas W....	Pvt., I.	Oct. 21	St. Louis, Mo.....	Do.
Jennings, Otto P.....	Corpl., H.	Oct. 6	do.....	Typhoid.
Kreidler, E. A.....	Corpl., B.	July 4	East Lake, Tenn.....	Do.
Kittrish, Jno.....	Pvt., M.	Aug. 30	Sternberg Hospital	Do.
Lange, Emile.....	Corpl., K.	Sept. 14	Camp Thomas, Ga.....	Do.
McConnell, Frank R..	Pvt., K.	Aug. 8	do.....	Peritonitis.
Overton, C. H.....	Pvt., B.	June 19	do.....	Cerebral spinal meningitis.
Parnelee, C. A.....	Corpl., A.	Aug. 31	St. Louis, Mo.....	(Typhoid) malarial.
Ratliffe, S. M.....	Pvt., B.	Aug. 15	Camp Thomas, Ga.....	Typhoid.
Sawyer, Eugene L.....	Pvt., C.	Oct. 14	Kirkwood, Mo.....	Do.
Wolff, Harry S.....	Pvt., D.	Sept. 19	St. Louis, Mo.....	Do.

Total deaths..... 14

Deaths from typhoid fever..... 11

Percentage of deaths among probable cases of typhoid fever (216), 5.09.

Percentage of deaths among recognized cases of typhoid fever (46), 23.91.

The cases in the above list in which the word typhoid occurs in parentheses were cases of typhoid fever, but in the official records at Washington death is attributed to the disease indicated outside of the parentheses.

FIFTH MARYLAND VOLUNTEER INFANTRY.

First Brigade, First Division, Third Army Corps.

The records concerning this regiment are very imperfect.

It reached Chickamauga Park, Ga., May 21, 1898, and left that place June 2, 1898. From Chickamauga this regiment was sent to Tampa, Fla., and became a part of the Fourth Army Corps.

The first report covers the period from June 9 to June 30, inclusive.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	979
Diarrhea.....	94
Dysentery.....	3
Malaria.....	28
Other diseases.....	66
Total.....	191

The regiment was encamped at Tampa, Fla., during the period covered by this report.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,308
Diarrhea.....	168
Dysentery.....	17
Malaria.....	146
Other diseases.....	121
Total.....	452

The regiment continued in its camp at Tampa, Fla., during the month of July.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength.....	1,174
Diarrhea.....	159
Dysentery.....	4
Malaria.....	344
Other diseases.....	33
Total.....	540

This report includes only eleven companies, Company F having been detached. The regiment was moved from Tampa Garrison to Tampa Heights August 1; and from Tampa Heights to Huntsville, Ala., August 18.

CONDENSED SICK REPORT FROM SEPTEMBER 1 TO 4, INCLUSIVE.

Mean strength	1,174
Diarrhea.....	20
Malaria.....	61
Other diseases.....	31
Total.....	112

This report continues for only eleven companies, Company F remaining detached.

This regiment left Huntsville, Ala., September 5 and reached Baltimore, Md., September 7. It was then disbanded on furlough preparatory to being mustered out.

We have attempted to ascertain the nature of the diseases designated as "malaria" in the monthly regimental reports of the Fifth Maryland. In order to do this we have taken the completed cases reported in this regiment and divided them into groups according to periods of duration, as will be seen from the following:

So-called malarials in the Fifth Maryland.

Group 1. Of two days or less in duration.....	214
Group 2. Of more than two days and less than seven days in duration.....	125
Group 3. Of less than thirteen days and more than six days in duration.....	29
Group 4. Of more than twelve days in duration.....	104

A like attempt has been made to classify the so-called diarrheas in the same regiment, with the following results:

So-called diarrheas in the Fifth Maryland.

Group 1. Of two days or less in duration.....	228
Group 2. Of more than two days and less than seven days in duration.....	124
Group 3. Of less than thirteen days and more than six days in duration.....	20
Group 4. Of more than twelve days in duration.....	31

The following is a list of the recognized and probable cases of typhoid fever found in the records of this regiment:

No. 1. Company A: Typhoid fever, June 25; transferred to Baltimore June 30.

No. 2. Company M: Diarrhea, July 1 to 17.

No. 3. Company M: Typhoid fever, July 2; sent to hospital July 20. The name of the hospital to which this patient was sent is not given. It frequently happens in the records of this regiment that the name of the hospital and the date are omitted.

No. 4. Company L: Typhoid fever, July 15; furloughed from hospital September 22.

No. 5. Company I: Typhoid fever, July 15; furloughed August 24.

No. 6. Company G: Typhoid fever, July 15; furloughed from hospital August 21.

No. 7. Company D: Typhoid fever, July 15; transferred August 27.

No. 8. Company H: Typhoid fever, July 15; transferred August 27.

No. 9. Company E: Typhoid fever; sent to Fort McPherson July 15; transferred to hospital train August 31.

No. 10. Company C: Typhoid fever; sent to Fort McPherson July 15; furloughed August 9. This man is recorded as having had diarrhea July 1 to 12.

No. 11. Company F: Typhoid fever; sent to Fort McPherson July 15; furloughed August 9.

No. 12. Company D: Typhoid fever, July 16; furloughed July 22.

No. 13. Company M: Typhoid fever, July 16, furloughed September 22.

No. 14. Company not given: Malaria, July 16; furloughed July 20.

No. 15. Company E: Typhoid fever, July 16; furloughed August 22.

No. 16. Company E: Typhoid fever, July 16; furloughed August 21.

No. 17. Company K: Typhoid fever, July 16; furloughed August 25.

No. 18. Company K: Typhoid fever, July 19; transferred July 20.

No. 19. Company I: Typhoid fever, July 19; transferred July 20.

No. 20. Company H: Typhoid fever, July 20; transferred July 31.

No. 21. Company B: Typhoid fever, July 20; transferred August 2.

No. 22. Company H: Typhoid fever, July 20; transferred August 2.

No. 23. Company F: Sent to Fort Thomas July 22. Here the disease was diagnosed malaria, and the patient was still sick September 8.

No. 24. Company A: Typhoid fever, July 22; sent to hospital without date.

No. 25. Company I: Sent to Fort Thomas July 22. Here the disease was diagnosed typhoid fever, and the man was mustered out October 22.

No. 26. Company G: Typhoid fever, July 23; transferred August 2.

No. 27. Company K: Malaria, July 24 to August 26.

No. 28. Company H: Malaria, July 24; sent to brigade hospital without date.

No. 29. Company C: Malaria, July 25 to August 18.

No. 30. Company H: Malaria, July 26; furloughed August 26.

No. 31. Company I: Malaria, July 27; sent to brigade hospital without date.

No. 32. Company A: Malaria, July 28; sent to brigade hospital without date.

No. 33. Company B: Typhoid fever, July 28; sent to brigade hospital without date.

No. 34. Company B: Malaria, July 29; sent to brigade hospital without date.

No. 35. Company H: Sent to Fort McPherson July 29. Here the disease was diagnosed typhoid fever and the patient was furloughed August 20.

No. 36. Company D: Malaria, July 30; sent to brigade hospital without date.

No. 37. Company A: Malaria, July 30 to August 13.

No. 38. Company K: Typhoid fever, July 31; sent to brigade hospital without date.

No. 39. Company I: Malaria, August 2; sent to brigade hospital without date.

No. 40. Company M: Diarrhea and malaria, August 2 to 23.

No. 41. Company G: Typhoid fever, August 2; sent to brigade hospital without date.

No. 42. Company C: Malaria, August 3; sent to brigade hospital without date.

No. 43. Company E: Typhoid fever, August 3; sent to brigade hospital without date.

No. 44. Company G: Dysentery, August 4; furloughed August 12.

No. 45. Company M: Malaria, August 5; sent to brigade hospital without date.

No. 46. Company D: Malaria, August 5 to 17.

No. 47. Company B: Malaria, August 6; sent to brigade hospital August 25.

No. 48. Company D: Malaria, August 6; sent to brigade hospital without date.

No. 49. Company D: Typhoid fever, August 6; sent to brigade hospital without date.

No. 50. Company M: Typhoid fever, August 7; sent to brigade hospital August 13; furloughed August 26.

No. 51. Company M: Malaria, August 8; sent to brigade hospital without date.

No. 52. Company M: Typhoid fever, August 8; sent to brigade hospital without date.

No. 53. Company C: Diarrhea, August 8 to 22.

No. 54. Company B: Malaria, August 9; sent to field hospital without date.

No. 55. Company E: Malaria, August 9; sent to corps hospital without date.

No. 56. Company M: Sent to Fort McPherson August 10 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 10.

No. 57. Company D: Malaria, August 11; sent to brigade hospital without date.

No. 58. Company H: Malaria, August 11 to 22.

No. 59. Company H: Typhoid fever, August 11; furloughed September 1.

No. 60. Company M: Malaria, August 14; sent to brigade hospital without date.

No. 61. Company E: Malaria, August 14; transferred without date.

No. 62. Company L: Malaria, August 14; sent to brigade hospital without date.

No. 63. Company C: Malaria, August 14; sent to brigade hospital without date.

No. 64. Company C: Malaria, August 15; furloughed August 23.

No. 65. Company B: Malaria, August 15; furloughed August 27.

No. 66. Company H: Dysentery, August 15; furloughed August 21.

No. 67. Company G: Malaria, August 16; furloughed August 22.

No. 68. Company G: Sent to Fort McPherson August 16 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient died September 1.

No. 69. Company G: Malaria, August 16; furloughed August 22.

No. 70. Company E: Sent to Fort McPherson August 16 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was transferred to a hospital train August 31.

No. 71. Company G: Typhoid fever, August 16; sent to brigade hospital without date.

No. 72. Company G: Malaria, August 20; furloughed August 26.

No. 73. Company not given: Malaria, August 20; furloughed August 26.

No. 74. Company M: Typhoid fever, August 20; furloughed August 26.

No. 75. Company C: Malaria, August 20; furloughed August 26.

No. 76. Company G: Typhoid fever, August 20; furloughed August 26.

No. 77. Company L: Malaria, August 22; furloughed from hospital without date. In hospital this case was diagnosed typhoid fever.

No. 78. Company G: Typhoid fever, August 22; furloughed August 26.

No. 79. Company H: Typhoid fever, August 22; furloughed August 26.

No. 80. Company A: Malaria, August 22; furloughed August 26.

No. 81. Company L: Typhoid fever, August 22; furloughed August 26.

No. 82. Company A: Dysentery, August 22; furloughed August 26.

No. 83. Company D: Typhoid fever, August 22; furloughed September 6.

No. 84. Company D: Malaria, August 22; furloughed August 26.

No. 85. Company G: Typhoid fever, August 22; furloughed September 18.

No. 86. Company I: Malaria, August 22; furloughed August 26.

No. 87. Company F: Sent to hospital without diagnosis August 22. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 24.

No. 88. Company K: Malaria, August 23; furloughed August 26.

No. 89. Company I: Malaria, August 23; furloughed August 26.

No. 90. Company K: Malaria, August 23; furloughed August 26.

No. 91. Company A: Malaria, August 23; furloughed August 26.

No. 92. Company C: Malaria, August 23; furloughed August 26.

No. 93. Company L: Malaria, August 23; sent to brigade hospital without date.

No. 94. Company M: Typhoid fever, August 23; furloughed August 26.

No. 95. Company A: Malaria, August 23; furloughed August 26.

No. 96. Company A: Malaria, August 23; furloughed August 26.

No. 97. Company K: Malaria, August 23; furloughed August 26.

No. 98. Company C: Malaria, August 23; furloughed August 26. After reaching home this case was diagnosed typhoid fever.

No. 99. Company F: Malaria, August 23; furloughed September 25.

No. 100. Company I: Malaria, August 23; furloughed August 26.

No. 101. Company F: Malaria, August 24; furloughed August 26.

No. 102. Company M: Malaria, August 24; furloughed August 26.

No. 103. Company I: Typhoid fever, August 24; furloughed August 26.

No. 104. Company B: Typhoid fever, August 24; furloughed August 26.

No. 105. Company A: Malaria, August 24; furloughed August 26. At home this case was diagnosed typhoid fever.

No. 106. Company I: Typhoid fever, August 24; furloughed August 26.

No. 107. Company A: Malaria, August 25; sent to brigade hospital without date.

No. 108. Company A: Malaria, August 25; furloughed August 26.

No. 109. Company L: Malaria, August 26; furloughed August 26. After reaching home this case was diagnosed typhoid fever.

No. 110. Company M: Malaria, August 26; furloughed August 26. After reaching home this case was diagnosed typhoid fever.

No. 111. Company B: Malaria, August 26; sent to brigade hospital without date.

No. 112. Company C: Malaria, August 26; sent to brigade hospital without date.

No. 113. Company H: Typhoid fever, August 26; furloughed August 26.

No. 114. Company M: Malaria, August 26; sent to brigade hospital without date. Afterwards this man, still sick, was sent to Baltimore.

No. 115. Company F: Sent to hospital without diagnosis August 26. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 18.

No. 116. Company A: Malaria, August 27; sent to Maryland general hospital at Baltimore September 3. Here the disease was diagnosed typhoid fever, and the man was discharged October 29.

No. 117. Company E: Malaria, August 27; sent to brigade hospital without date.

No. 118. Company F: Malaria, August 27; transferred August 27.

No. 119. Company C: Malaria, August 27; sent to brigade hospital without date.

No. 120. Company I: Typhoid fever, August 27; furloughed September 15.

No. 121. Company E: Typhoid fever, August 27; furloughed without date.

No. 122. Company M: Typhoid fever, August 27; sent to brigade hospital August 27; furloughed September 15.

No. 123. Company H: Typhoid fever, August 27; sent to brigade hospital without date.

No. 124. Company H: Malaria, August 28; furloughed August 28.

No. 125. Company G: Malaria, August 28; furloughed September 1.

No. 126. Company M: Dysentery, August 28; furloughed September 1.

No. 127. Company B: Typhoid fever, August 28; died September 10.

No. 128. Company H: Malaria, August 29; sent to corps hospital without date.

No. 129. Company L: Malaria, August 29; sent to hospital at Baltimore without date. In this hospital the disease was diagnosed typhoid fever.

No. 130. Company B: Sent to Fort Monroe August 29 without diagnosis. Here the disease was diagnosed malaria, and the patient was furloughed September 17.

No. 131. Company H: Typhoid fever, August 29; sent to corps hospital without date.

No. 132. Company L: Typhoid fever, August 29; sent to brigade hospital without date.

No. 133. Company L: Malaria, August 30; furloughed September 1.

No. 134. Company H: Malaria, August 30; furloughed September 1.

No. 135. Company L: Malaria, August 30; furloughed September 1.

No. 136. Company G: Typhoid fever, August 30; transferred September 1.

No. 137. Company C: Typhoid fever, August 30; transferred September 14.

No. 138. Company E: Typhoid fever, August 30; sent to brigade hospital without date.

No. 139. Company K: Typhoid fever, August 30; sent to Baltimore without date.

No. 140. Company M: Typhoid fever, August 30; sent to corps hospital without date.

No. 141. Company D: Malaria, August 31; sent to brigade hospital without date.

No. 142. Company L: Typhoid fever, August 31; furloughed September 1.

No. 143. Company L: Malaria, August 31; sent to brigade hospital without date.

No. 144. Company M: Malaria, August 31; sent to brigade hospital without date.

No. 145. Company L: Malaria, August 31; furloughed September 1.

No. 146. Company L: Malaria, August 31; furloughed August 31.

No. 147. Company B: Typhoid fever, August 31; sent to Johns Hopkins Hospital September 1.

No. 148. Company L: Malaria, August 31; sent to brigade hospital without date.

No. 149. Company K: Malaria, August 31; sent to hospital at Baltimore without date.

No. 150. Company K: Typhoid fever, August 31; sent to brigade hospital without date.

No. 151. Company A: Malaria, August 31; furloughed without date.

No. 152. Company H: Malaria, September 1; sent to brigade hospital without date.

No. 153. Company C: Diarrhea, September 1; furloughed September 1.

No. 154. Company G: Malaria, September 1; sent to brigade hospital without date.

No. 155. Company H: Malaria, September 1; sent to brigade hospital without date.

No. 156. Company M: Malaria, September 1; sent to brigade hospital without date.

No. 157. Company C: Malaria, September 1; furloughed September 1.

No. 158. Company K: Malaria, September 1; sent to brigade hospital without date.

No. 159. Company E: Malaria, September 1; furloughed September 15.

No. 160. Company H: Typhoid fever, September 1; sent to brigade hospital without date.

No. 161. Company E: Malaria, September 1; furloughed September 1.

No. 162. Company E: Diarrhea, September 1; furloughed September 1.

No. 163. Company K: Typhoid fever, September 1; sent to brigade hospital without date.

No. 164. Company K: Malaria, September 2; sent to brigade hospital without date.

No. 165. Company E: Malaria, September 2; sent to brigade hospital without date.

No. 166. Company M: Malaria, September 2; sent to brigade hospital without date.

No. 167. Company A: Malaria, September 3; furloughed September 6.

No. 168. Company F: Malaria, September 3; sent to Johns Hopkins Hospital. Here the disease was diagnosed typhoid fever, and the patient was dismissed after forty-four days in hospital.

No. 169. Company B: Sent to Johns Hopkins Hospital without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged after twenty-six days in hospital.

No. 170. Company H: Sent to Johns Hopkins Hospital without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged after forty-two days in hospital.

No. 171. Company D: Sent to Johns Hopkins Hospital without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged after forty-nine days in hospital.

No. 172. Company E: Sent to General Hospital at Baltimore without diagnosis September 3. Here the disease was diagnosed dysentery, and the patient was furloughed September 28.

No. 173. Company A: Sent to General Hospital at Baltimore without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged October 24.

No. 174. Company C: Sent to Johns Hopkins Hospital without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged after thirty-two days in hospital.

No. 175. Company A: Sent to General Hospital at Baltimore without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged October 24.

No. 176. Company F: Sent to General Hospital at Baltimore without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged October 10.

No. 177. Company L: Sent to General Hospital at Baltimore without diagnosis September 3. Here the disease was diagnosed malaria, and the patient was discharged September 26.

No. 178. Company K: Sent to Johns Hopkins Hospital without diagnosis September 3. Here the disease was diagnosed aestivo-autumnal fever, and the patient was discharged after seventeen days in hospital.

No. 179. Company E: Sent to hospital in Baltimore without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged after thirty-one days in hospital.

No. 180. Company M: Sent to Johns Hopkins Hospital without diagnosis September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged after thirty-eight days in hospital.

No. 181. Company F: Malaria, September 16; sent to hospital in Baltimore September 18.

No. 182. Company H: Sent to Fort McPherson without diagnosis September 28. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 9.

The following additional cases are recorded without date:

No. 183. Company A: Sent to hospital in Baltimore, where the disease was diagnosed typhoid fever.

No. 184. Company B: Sent to hospital in Baltimore, where the disease was diagnosed typhoid fever.

No. 185. Company F: Sent to hospital in Baltimore, where the disease was diagnosed typhoid fever.

No. 186. Company M: Sent to University Hospital, Baltimore; typhoid fever.

No. 187. Company F: Sent to University Hospital, Baltimore; typhoid fever.

No. 188. Company H: Sent to University Hospital, Baltimore; typhoid fever.

No. 189. Company L: Sent to University Hospital, Baltimore; typhoid fever.

No. 190. Company not given. Sent to University Hospital, Baltimore; typhoid fever.

No. 191. Company B: Sent to University Hospital, Baltimore; typhoid fever.

No. 192. Company B: Sent to University Hospital, Baltimore; typhoid fever.

No. 193. Company M: Sent to University Hospital, Baltimore; typhoid fever.

No. 194. Company not given: Sent to University Hospital, Baltimore; typhoid fever.

No. 195. Company G: Sent to University Hospital, Baltimore; typhoid fever.

No. 196. Company I: Sent to University Hospital, Baltimore; typhoid fever.

No. 197. Company M: Sent to University Hospital, Baltimore; typhoid fever.

No. 198. Hospital Steward: Sent to University Hospital, Baltimore; typhoid fever.

No. 199. Company C: Sent to University Hospital, Baltimore; typhoid fever.

No. 200. Company F: Sent to University Hospital, Baltimore; typhoid fever.

No. 201. Company F: Sent to University Hospital, Baltimore; typhoid fever.

No. 202. Company C: Sent to University Hospital, Baltimore; malaria.

No. 203. Company E: Sent to University Hospital, Baltimore; typhoid fever.

No. 204. Company E: Sent to University Hospital, Baltimore. Here the patient died from intestinal hemorrhage.

No. 205. Company F: Sent to University Hospital, Baltimore; typhoid fever.

No. 206. Company I: Sent to University Hospital, Baltimore; typhoid fever.

No. 207. Company K: Sent to University Hospital, Baltimore; typhoid fever.

No. 208. Company L: Sent to University Hospital, Baltimore; typhoid fever.

No. 209. Company not given: Sent to University Hospital, Baltimore; typhoid fever.

No. 210. Company not given: Sent to University Hospital, Baltimore; typhoid fever.

No. 211. Company A: Sent to University Hospital, Baltimore; malaria.

No. 212. Company H: Malaria; sent to corps hospital without date.

No. 213. Company not given: Sent to University Hospital, Baltimore; typhoid fever.

No. 214. Company H: Sent to University Hospital, Baltimore; typhoid fever.

No. 215. Company I: Sent to University Hospital, Baltimore; typhoid fever.

No. 216. Company M: Sent to University Hospital, Baltimore; typhoid fever.

No. 217. Company not given: Sent to University Hospital, Baltimore; typhoid fever.

No. 218. Company D: Sent to University Hospital, Baltimore; typhoid fever.

No. 219. Company E: Sent to University Hospital, Baltimore; typhoid fever.

No. 220. Company E: Sent to University Hospital, Baltimore; typhoid fever.

No. 221. Company E: Sent to University Hospital, Baltimore; typhoid fever.

No. 222. Company D: Sent to general hospital, Baltimore; typhoid fever.

No. 223. Company I: Sent to general hospital, Baltimore; typhoid fever.

No. 224. Company M: Sent to general hospital, Baltimore; typhoid fever.

No. 225. Staff: Sent to general hospital, Baltimore; typhoid fever.

No. 226. Company not given: Sent to general hospital, Baltimore; typhoid fever.

No. 227. Company K: Typhoid fever, without date; sent to brigade hospital without date.

No. 228. Company D: Typhoid fever, without date; sent to corps hospital without date.

No. 229. Company not given: Sent to University Hospital, Baltimore; typhoid fever.

No. 230. Company B: Sent to University Hospital, Baltimore; typhoid fever.

No. 231. Company F: Sent to University Hospital, Baltimore; typhoid fever.

No. 232. Company G: Sent to University Hospital, Baltimore; typhoid fever.

No. 233. Company G: Sent to University Hospital, Baltimore; typhoid fever.

No. 234. Company I: Sent to University Hospital, Baltimore; typhoid fever.

No. 235. Company B: Sent to University Hospital, Baltimore; typhoid fever.

No. 236. Company F: Sent to University Hospital, Baltimore; typhoid fever.

No. 237. Company G: Sent to University Hospital, Baltimore; typhoid fever.

No. 238. Company I: Sent to University Hospital, Baltimore; died of intestinal perforation.

No. 239. Company not given: Sent to corps hospital without date. Here the disease was diagnosed typhoid fever.

No. 240. Company not given: Sent to corps hospital without date. Here the disease was diagnosed typhoid fever.

No. 241. Company L: Sent to University Hospital, Baltimore; typhoid fever; died of intestinal hemorrhage.

No. 242. Company E: Sent to University Hospital, Baltimore; typhoid fever.

No. 243. Company K: Sent to University Hospital, Baltimore; typhoid fever.

No. 244. Company K: Sent to University Hospital, Baltimore; typhoid fever.

No. 245. Company M: Sent to University Hospital, Baltimore; typhoid fever. The hospital record shows that this man had intestinal hemorrhage, without statement of result, from which it is inferred that he recovered.

No. 246. Company not given: Sent to University Hospital, Baltimore; typhoid fever; died. The typhoid fever in this case was complicated with pneumonia.

No. 247. Company not given: Sent to University Hospital, Baltimore; typhoid fever.

No. 248. Company not given: Sent to University Hospital, Baltimore; typhoid fever.

No. 249. Company G: Sent to University Hospital, Baltimore; typhoid fever.

No. 250. Company B: Sent to general hospital, Baltimore; typhoid fever.

SUMMARY.

Assembled near Baltimore, Md., in April, 1898.

Mustered into United States service about May 10, 1898.

Arrived at Chickamauga Park, Ga., May 21, 1898.

Strength on arrival, 979.

There were no cases of typhoid fever developed during the regiment's stay at Chickamauga Park.

Left Chickamauga Park June 2, 1898.

Strength on departure, 985.

Arrived at Tampa, Fla., June 5, 1898.

Date of first case of probable typhoid fever, June 25, 1898.

Date of first case of recognized typhoid fever, June 25, 1898.

Left Tampa garrison August 1, 1898.

Number of cases of probable typhoid fever developed at Tampa garrison	38
Reached Tampa Heights August 1, 1898.	
Left Tampa Heights August 18, 1898.	
Number of cases of probable typhoid fever developed at Tampa Heights	33
Reached Huntsville, Ala., August 21, 1898.	
Left Huntsville, Ala., September 5, 1898.	
Number of cases of probable typhoid fever developed at Huntsville, Ala.	109
Went from Huntsville, Ala., to Baltimore, Md.	
The number of cases of probable typhoid fever sent to hospitals in Baltimore	70
Total number of cases of probable typhoid fever developed in the Fifth Maryland Volunteer Infantry from May to September, 1898.	250

We fear that the distribution of cases as given in the above table is not correct. The records of the cases sent to hospitals in Baltimore have been furnished us without date. It is more than probable that many of these cases were furloughed from Tampa and Huntsville; therefore should have their initial dates much earlier than is indicated above.

These 250 cases were diagnosed as follows:

Typhoid fever.....	147
Malaria.....	89
Diarrhea.....	5
Dysentery.....	5
Hemorrhage from the bowels.....	2
Perforation of the bowels.....	1
Æstivo-autumnal fever.....	1
Total.....	250

The number of recognized cases of typhoid fever in this regiment would not have been so great had not so many of the cases been sent to hospitals. Very few cases were diagnosed typhoid fever by the regimental surgeons.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Belt, Boyd G.....	Sgt., F.	Aug. 9	Tampa, Fla.....	Typhoid.
Brady, Edwin.....	Pvt., K.	Oct. 21	Baltimore, Md.....	Do.
Cook, George.....	Pvt., B.	Aug. 23	Tampa, Fla.....	Diffuse peritonitis.
Carrigan, N. J.....	Pvt., K.	July 29	Fort Thomas, Ky.....	Typhoid.
Childs, Lawrence.....	Pvt., D.	Oct. 19	Baltimore, Md.....	Do.
Fowler, Lemuel M.....	Pvt., H.	Sept. 16	do.....	Do.
Hopkins, M. R.....	Sgt., E.	Sept. 4	do.....	Do.
Housholder, J. E.....	Pvt., G.	Sept. 1	Fort McPherson, Ga.....	Do.
Johnson, Harry W.....	Pvt., F.	Sept. 14	Baltimore, Md.....	Do.
Kastner, James J.....	Pvt., A.	Aug. 22	West Tampa, Fla.....	Do.
Langbert, A. M.....	Pvt., B.	Sept. 10	Huntsville, Ala.....	Do.
Petzold, Charles P.....	Pvt., D.	Aug. 21	Tampa, Fla.....	Do.
Robinson, W. D.....	LT. Col.	Sept. 28	Atlanta, Ga.....	Do.
Stratmeyer, Louis B.....	Pvt., G.	Aug. 26	Fort McPherson, Ga.....	Do.
Summers, E. H.....	Pvt., I.	Sept. 23	Baltimore, Md.....	Do.
Weiszberger, H. L.....	Pvt., E.	Sept. 12	do.....	Do.
White, Albert A.....	Corpl., F.	Sept. 1	do.....	Do.
Wolfe, Thomas M.....	Pvt., A.	Aug. 21	Tampa Heights, Fla.....	Do.
Total deaths.....				18
Deaths due to typhoid fever.....				17
Percentage of deaths among probable cases of typhoid fever (250), 6.80.				
Percentage of deaths among recognized cases of typhoid fever (147), 11.56.				

Apparently this regiment did not carry any typhoid infection to Chickamauga nor receive any at that place. The first case, so far as we can ascertain, happened nearly three weeks after the regiment reached Tampa.

It is interesting to note that of 85 cases of protracted fever sent to the hospitals in Baltimore, where presumably blood tests were made, only 5 were found to be cases of malaria. Nearly all of these were sent to Baltimore with a diagnosis of malaria. Unfortunately, we have no detailed history of any of these cases, and it is impossible to say whether blood examinations were made in all of them or not. It is to be presumed that the malarial parasite was found in 5 out of the 85 cases. The æstivo-autumnal parasite was certainly found in 1 case. These figures probably give a very good idea of the relative frequency of malaria among the troops that remained in the United States.

COMMUNICATIONS FROM THE SURGEONS OF THE FIFTH MARYLAND VOLUNTEER INFANTRY.

Medical officers.

John G. Jay, major and surgeon, Baltimore, Md.

Samuel C. Davis, jr., captain and assistant surgeon, Baltimore, Md.

Thaddeus W. Clark, captain and assistant surgeon, Baltimore, Md.

Captain Davis states:

I do think that if Circular No. 1, dated at Surgeon-General's Office April 25, 1898, had been carried out, we would not have had the 225 or 250 cases of typhoid fever that we did have.

From a communication from Major Jay we condensed the following:

At Chickamauga the camp of this regiment was in a piece of woodland near the creek. The rocky character of the soil rendered the digging of pits to a sufficient depth impossible. There was no provision for obtaining water within the regimental lines. Drinking water was obtained by collecting surface water in pits dug in a swampy place. Some drinking water was obtained from Chickamauga Creek. I am convinced that the typhoid infection was introduced into our regiment at this time, although it did not develop until somewhere after we had been at Tampa. There is no good reason for believing that typhoid bacilli may not remain latent for at least three weeks, perhaps considerably longer in the body. After such a time these germs may be swept from the intestines, leaving their host unharmed; or, favorable conditions developing, such as result from fatigue, the germs may, weeks after exposure, develop the disease.

We arrived at Tampa, Fla., June 5, and were assigned to a position on "old garrison grounds," our camp being contiguous to those of the First District of Columbia and the Second New York. The three regiments were encamped upon an area which was no more than sufficient for one. About the only redeeming feature of this place was the drinking water, which was obtained from the city supply of Tampa and was supposed to be clear and wholesome. The cramped space allotted to our brigade was a source of much anxiety to myself and the other regimental surgeons, and we were not surprised when typhoid fever, diarrhea, and dysentery appeared. We were hemmed in on all sides by objectionable conditions. On one side was a corral of hundreds of horses and mules; on the opposite side was the shallow bay with its foul and widely extended black mud flats, which were exposed at every ebb tide, the breezes from thence bringing an odor resembling that from foul city sewers. On the other two sides, our animals and those of the First District of Columbia were unavoidably too near us. Our kitchen and privy sinks were not more than 60 feet from the mess tents. Before we left there was no available ground upon which to dig new sinks, and upon digging almost anywhere in the space allotted to us former pits were encountered—some of them recent, some apparently dating back many years, as the contents were in some instances converted into a sort of adipocere. The flies, encouraged and nourished by all favoring conditions, were present everywhere and in everything in countless myriads, visiting alternately the kitchens and privy pits. I think that the flies constituted the most important factor in the spread of infection.

About the last of July our camp was moved to Tampa Heights. At this place we had more space than at the other camp and could locate the sinks to better advantage, but there were several extensive depressions where water collected and from which it could not by any possibility be drained. These stagnant pools swarmed with the larvæ of mosquitoes of a most vicious variety, and these were probably accountable for our malarial troubles. I frequently had to condemn the vegetables which were furnished us, the potatoes and onions often being decomposed and in a most offensive condition when the barrels were opened. The fresh meat was good; sometimes not. The so-called "canned roast beef"

was, I suspected, from the beef-extract factories, and was not appetizing. I frequently saw men vomit it several hours, sometimes the next day, after eating it, apparently untouched by the digestive fluids.

The regiment left Tampa August 18 and arrived at Huntsville August 21. The location of our camp at Huntsville was all that could be desired. The climate was healthful and the water was excellent. Here the condition of the men somewhat improved; nevertheless typhoid fever, diarrhea, and malaria prevailed to a considerable extent. We were not here long enough for the influence of the excellent climate and other conditions to produce a pronouncedly beneficial effect.

Major Jay, very properly in our opinion, objected to the transportation of those very sick with typhoid fever from Huntsville to Baltimore. He states that of eight men so desperately ill with typhoid fever at Huntsville that their removal by hospital train was not permitted, everyone recovered; while of the cases carried to Baltimore eight died. There can be no doubt that some of these were victims of the misdirected zeal of those instrumental in their removal, and that the loss of life would have been less had these men been allowed to remain at Huntsville. As a matter of fact it would have been much better had the entire regiment remained in camp at this place for a month longer, where recuperation would have been more rapid and whereby many cases of illness which occurred after the return of the men to Baltimore could have been averted. It was natural enough for the friends and the relatives of the soldiers to desire that they should come home, but a comprehensive view of the situation, including the best interests of the sick from a medical point of view, could not, of course, be expected of the friends at home.

Better counsel, however, might have been expected from some members of the medical profession who advised the bringing of these sufferers by a long, fatiguing journey from the excellent conditions prevailing at Huntsville to the sultry vitiated air of the city, where typhoid fever was already prevalent.

SECOND NEBRASKA VOLUNTEER INFANTRY.

Second Brigade, First Division, Third Army Corps.

This regiment reached Chickamauga Park, Ga., May 22, 1898. The first report is signed by Maj. M. A. Hoover, who makes the following statement:

The medical condition of the camp, outside of the diseases incident to and consequent upon the change of climate and water, has been excellent. Bowel troubles, such as diarrhea and dysentery, zymotic diseases, such as measles, and some cases of acute bronchitis and tonsillitis have been the prevailing troubles. An order has been issued that all drinking water be boiled. Cases of measles have been placed in isolated tents and a guard prevents all unnecessary communication with the rest of the command.

CONDENSED SICK REPORT FROM MAY 21 to 31, INCLUSIVE.

Mean strength	1,020
Dysentery	3
Diarrhea	80
Other diseases	31
Total	114

The June report is signed by Capt. M. A. Robert, who makes the following statement:

The medical condition of the command, outside of the diseases incident to and consequent upon the change of climate and water, has been excellent. Bowel troubles, such as diarrhea and dysentery, zymotic diseases, such as measles, and some colds and sore throats have been the prevailing troubles. Orders were issued to have all water used for drinking boiled.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,133
Typhoid fever	1
Intermittent fever	2
Dysentery	4
Gastritis	1
Diarrhea	203
Other diseases	76
Total	287

In the July report Captain Robert makes the following statement:

The prevailing diseases are diarrhea and some dysentery, due to change of climate and water. All water for drinking is boiled previous to using, and all water for cooking is either boiled or filtered.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,317
Typhoid fever	6
Malarial fever	27
Enteritis	2
Gastro-enteritis	3
Dysentery	4
Gastritis	1
Diarrhea	160
Other diseases	64
Total	267

Major Hoover signs the August report and makes the following statement:

The prevailing diseases are malarial fever, remittent and intermittent, with complications of diarrhea and dysentery, due to poisonous emanations from infected soil in Chickamauga Park.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,171
Typhoid fever	16
Malarial fever	115
Diarrhea	114
Gastro-enteritis	1
Gastritis	1
Enteritis	4
Dysentery	2
Other diseases	29
Total	282

There is no report from this regiment after August. The following is a list of the recognized and probable cases of typhoid fever:

- No. 1. Company E: Diarrhea, May 26; still sick July 31.
- No. 2. Company G: Diarrhea, June 9; still sick June 30.
- No. 3. Company E: Intermittent malaria. June 14; furloughed from division hospital August 29.

No. 4. Company A: Gastritis, June 15; furloughed from division hospital August 26.

No. 5. Company A: Intestinal colic, June 18; still sick June 30.

No. 6. Company A: Diarrhea, June 18; still sick August 31.

No. 7. Company C: Diarrhea, June 21; furloughed July 6.

No. 8. Company A: Diarrhea, June 26; still sick in hospital July 31.

No. 9. Company A: Diarrhea, June 28; still sick July 31.

No. 10. Company D: Typhoid fever, June 30; furloughed from division hospital August 26.

No. 11. Company H: Tertian malaria, July 2 to 17.

No. 12. Company E: Diarrhea, July 2; still sick July 31.

No. 13. Company D: Tertian malaria, July 3; still sick July 31.

No. 14. Company M: Diarrhea, July 5; still sick July 31.

No. 15. Company G: Typhoid fever, July 7; still sick August 31.

No. 16. Company E: Intermittent malaria, July 8; still sick July 31.

No. 17. Company E: Malaria, July 9; still sick July 31.

No. 18. Company B: Typhoid fever, July 11; still sick in quarters July 31.

No. 19. Company B: Typhoid fever, July 12; sent to Fort McPherson July 24.

No. 20. Company M: Quotidian malaria, July 12; furloughed August 11.

No. 21. Company F: Intermittent malaria, July 13; furloughed August 26.

No. 22. Company I: Intermittent malaria, July 14; still sick August 31.

No. 23. Company D: Dysentery, July 14; furloughed July 22.

No. 24. Company H: Quotidian malaria, July 16; still sick August 31.

No. 25. Company H: Quotidian malaria, July 16; furloughed August 26.

No. 26. Company H: Diarrhea, July 16; furloughed August 26.

No. 27. Company D: Quotidian malaria, July 16; furloughed August 24.

No. 28. Company B: Remittent malaria, July 17; still sick August 31.

No. 29. Company F: Intermittent malaria, July 17; furloughed August 26.

No. 30. Company M: Typhoid fever, July 20; furloughed August 24.

No. 31. Company E: Tertian malaria, July 22; still sick August 31.

No. 32. Company M: Remittent malaria, July 23; furloughed July 30.

No. 33. Company G: Tertian malaria, July 24; furloughed August 10.

No. 34. Company E: Typhoid fever, July 24; still sick August 31.

No. 35. Company L: Typhoid fever, July 24; furloughed August 24.

No. 36. Company E: Remittent malaria, July 24; still sick August 31.

No. 37. Company K: Quotidian malaria, July 24; still sick August 31.

No. 38. Company G: Remittent malaria, July 24; furloughed August 2.

No. 39. Company M: Typhoid fever, July 25; furloughed August 24.

No. 40. Company M: Typhoid fever, July 26; died in Leiter Hospital August 8.

No. 41. Company D: Quotidian malaria, July 29; furloughed from Sternberg Hospital September 9. In the hospital this case was diagnosed typhoid fever.

No. 42. Company I: Intermittent malaria, July 29; furloughed August 24.

No. 43. Company C: Remittent malaria, July 29; furloughed August 24.

No. 44. Company M: Typhoid fever, July 30 to August 23.

No. 45. Company K: Diarrhea, August 1; furloughed August 12.

No. 46. Company L: Remittent malaria, August 1; furloughed August 13. This man was a recent recruit.

No. 47. Company K: Quotidian malaria, August 1; furloughed from division hospital August 24. In the hospital this case was diagnosed typhoid fever.

No. 48. Company F: Diarrhea, August 1; furloughed from division hospital August 26.

No. 49. Company F: Quotidian malaria, August 1; furloughed from division hospital August 26. In hospital this case was diagnosed diarrhea.

No. 50. Company M: Enteritis, August 1; furloughed August 26.

No. 51. Company G: Diarrhea, August 1; furloughed from division hospital August 13. In the hospital this case was diagnosed remittent malaria.

No. 52. Company D: Remittent malaria, August 1; furloughed from division hospital August 26. In the hospital this case was diagnosed typhoid fever.

No. 53. Company I: Remittent malaria, August 1; furloughed August 26.

No. 54. Company A: Tertian malaria, August 1; furloughed from division hospital August 29. In the hospital this case was diagnosed remittent malaria.

No. 55. Company H: Diarrhea, August 1; furloughed August 26.

No. 56. Company H: Diarrhea, August 1; still sick in hospital August 31.

No. 57. Company H: Remittent malaria, August 1; furloughed August 30.

No. 58. Company M: Typhoid fever, August 1; furloughed August 21.

No. 59. Company M: Typhoid fever, August 2; furloughed August 24.

No. 60. Company F: Remittent malaria, August 2; furloughed August 26.

No. 61. Company B: Remittent malaria, August 2; furloughed August 29.

No. 62. Company K: Remittent malaria, August 2; furloughed August 22.

No. 63. Company E: Intermittent malaria, August 3; furloughed August 26.

No. 64. Company M: Quotidian malaria, August 3; still sick August 31.

No. 65. Company F: Remittent malaria, August 3; furloughed August 26.

No. 66. Company G: Quotidian malaria, August 3; furloughed August 26.

No. 67. Company B: Enteritis, August 4; furloughed August 26.

No. 68. Company G: Quotidian malaria, August 4; still sick August 31.

No. 69. Company L: Quotidian malaria, August 4; furloughed August 26.

No. 70. Company H: Enteritis, August 5; furloughed August 29.

No. 71. Company H: Typhoid fever, August 5; furloughed August 24.

No. 72. Company G: Remittent malaria, August 5; furloughed August 24.

No. 73. Company G: Remittent malaria, August 6; still sick August 31.

No. 74. Company B: Remittent malaria, August 6; furloughed August 26.

No. 75. Company F: Quotidian malaria, August 6; furloughed August 24.

No. 76. Company G: Remittent malaria, August 6; furloughed August 18.

No. 77. Company L: Remittent malaria, August 7; furloughed August 26. This man is recorded as having had dysentery June 14 to 28 and again July 10 to 16.

No. 78. Company G: Quotidian malaria, August 7; furloughed August 26.

No. 79. Company G: Intermittent malaria, August 7; furloughed August 14.

No. 80. Company K: Quotidian malaria, August 7; furloughed August 16.

No. 81. Company G: Remittent malaria, August 7; furloughed August 28.

No. 82. Company E: Typhoid fever, August 7; died in Sternberg Hospital September 19.

No. 83. Company M: Remittent malaria, August 8; furloughed August 26.

No. 84. Company A: Quotidian malaria, August 8; died in Leiter Hospital September 17.

No. 85. Company K: Remittent malaria, August 9; furloughed August 26.

No. 86. Company M: Remittent malaria, August 9; furloughed August 26.

No. 87. Company M: Diarrhea, August 9; furloughed August 27. In hospital this case was diagnosed typhoid fever.

No. 88. Company D: Enteritis, August 10; furloughed August 29. In hospital this case was diagnosed typhoid fever.

No. 89. Company E: Remittent malaria, August 10; furloughed August 20.

No. 90. Company M: Remittent malaria, August 10; furloughed August 22.

No. 91. Company M: Quotidian malaria, August 11; furloughed August 22.

No. 92. Company B: Quotidian malaria, August 11; furloughed August 18.

No. 93. Company B: Remittent malaria, August 11; furloughed August 26.

No. 94. Company M: Quotidian malaria, August 11; furloughed August 26.

No. 95. Company M: Quotidian malaria, August 12; still sick August 31.

No. 96. Company G: Quotidian malaria, August 12; furloughed from Leiter Hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 97. Company I: Dysentery, August 12; furloughed from division hospital August 27. In hospital this case was diagnosed remittent malaria.

No. 98. Company C: Quotidian malaria, August 12; furloughed from Leiter Hospital August 26. In hospital this case was diagnosed typhoid fever.

No. 99. Band: Typhoid fever, August 13; furloughed August 24.

No. 100. Company E: Typhoid fever, August 13; died in division hospital August 18.

No. 101. Company I: Quotidian malaria, August 13; still sick in Leiter Hospital August 31. In hospital this case was diagnosed typhoid fever.

No. 102. Company A: Remittent malaria, August 13; furloughed August 22.

No. 103. Company G: Quotidian malaria, August 14; furloughed August 29.

No. 104. Company G: Quotidian malaria, August 14; furloughed August 26.

No. 105. Company K: Quotidian malaria, August 14; furloughed August 18.

No. 106. Company A: Typhoid fever, August 14; furloughed August 26.

No. 107. Company L: Remittent malaria, August 14; furloughed from division hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 108. Company E: Quotidian malaria, August 15; furloughed August 29.

No. 109. Company E: Remittent malaria, August 15; furloughed from Leiter Hospital September 15. In hospital this case was diagnosed typhoid fever.

No. 110. Company E: Typhoid fever, August 15; still sick in division hospital September 30.

No. 111. Company I: Quotidian malaria, August 15; furloughed August 29.

No. 112. Company C: Quotidian malaria, August 15; furloughed August 26.

No. 113. Company M: Quotidian malaria, August 15; furloughed from division hospital August 28. In hospital this case was diagnosed typhoid fever.

No. 114. Company D: Quotidian malaria, August 15; furloughed August 24.

No. 115. Company not given: Remittent malaria, August 15; furloughed August 24.

No. 116. Company G: Quotidian malaria, August 15; furloughed from Leiter Hospital August 22. In hospital this case was diagnosed typhoid fever.

No. 117. Company A: Diarrhea, August 16; furloughed August 24.

No. 118. Company E: Typhoid fever, August 16; still sick in Sternburg hospital August 31.

No. 119. Company H: Diarrhea, August 16; furloughed August 24.

No. 120. Company A: Diarrhea, August 16; furloughed August 24.

No. 121. Company G: Remittent malaria, August 16; furloughed August 26.

No. 122. Company E: Typhoid fever, August 16; furloughed from Leiter Hospital September 30.

No. 123. Company E: Typhoid fever, August 17; furloughed August 21.

No. 124. Company B: Typhoid fever, August 17; furloughed August 29.

No. 125. Company G: Quotidian malaria, August 17; furloughed August 29.

No. 126. Company D: Diarrhea, August 18; furloughed August 23.

No. 127. Company K: Quotidian malaria, August 18; furloughed August 29.

No. 128. Band: Quotidian malaria, August 19; furloughed August 26.

No. 129. Band: Quotidian malaria, August 19; furloughed August 29.

No. 130. Company A: Remittent malaria, August 19; furloughed August 23.

No. 131. Company G: Typhoid fever, August 20; furloughed August 22.

No. 132. Company A: Typhoid fever, August 20; furloughed August 22.

No. 133. Company E: Diarrhea, August 20; furloughed August 24.

No. 134. Company C: Quotidian malaria, August 20; furloughed August 29.

No. 135. Company M: Remittent malaria, August 20; furloughed from Leiter Hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 136. Company G: Quotidian malaria, August 20; furloughed from division hospital September 19. In hospital this case was diagnosed typhoid fever.

No. 137. Company M: Remittent malaria, August 20; furloughed August 22.

No. 138. Company K: Quotidian malaria, August 20; furloughed August 29.

No. 139. Company E: Quotidian malaria, August 20; furloughed August 29.

No. 140. Company G: Typhoid fever, August 20; still sick in Leiter Hospital August 31.

No. 141. Company A: Diarrhea, August 20; furloughed August 26.

No. 142. Company E: Diarrhea, August 20; furloughed August 30.

No. 143. Company E: Typhoid fever, August 20; furloughed September 8.

No. 144. Company K: Remittent malaria, August 20; furloughed August 29.

- No. 145. Company K: Quotidian malaria, August 21; still sick August 31.
- No. 146. Company K: Quotidian malaria, August 21; furloughed August 29.
- No. 147. Company K: Quotidian malaria, August 22; furloughed August 29.
- No. 148. Company D: Quotidian malaria, August 23; furloughed August 29.
- No. 149. Company B: Typhoid fever, August 23; furloughed from Leiter Hospital September 17.
- No. 150. Company K: Typhoid fever, August 23; still sick in Leiter Hospital August 31.
- No. 151. Company K: Quotidian malaria, August 23; furloughed August 29.
- No. 152. Company B: Typhoid fever, August 23; furloughed from division hospital September 30.
- No. 153. Company G: Typhoid fever August 23; furloughed from Leiter Hospital September 27.
- No. 154. Company E: Diarrhea, August 23; furloughed August 29.
- No. 155. Company B: Typhoid fever, August 25; furloughed August 29.
- No. 156. Company G: Quotidian malaria, August 25; furloughed from division hospital August 28. In hospital this case was diagnosed typhoid fever.
- No. 157. Company A: Typhoid fever, August 25; furloughed August 29.
- No. 158. Company L: Quotidian malaria, August 25; furloughed from division hospital August 29. In hospital this case was diagnosed typhoid fever.
- No. 159. Company K: Typhoid fever, August 26; furloughed August 29. On the record this man is reported for duty, but this must be a mistake.
- No. 160. Company G: Quotidian malaria, August 26; furloughed August 30.
- No. 161. Company E: Typhoid fever, August 27; furloughed August 29.
- No. 162. Company B: Quotidian malaria, August 28; furloughed from Leiter Hospital October 4. In hospital this case was diagnosed typhoid fever.
- No. 163. Company K: Typhoid fever, August 29; furloughed August 29.
- No. 164. Company A: Typhoid fever, August 30; furloughed from Sternberg Hospital October 15.
- No. 165. Company E: Typhoid fever, August 30; died in Sternberg Hospital September 11.
- No. 166. Company E: Typhoid fever, August 30; furloughed from Sternberg Hospital September 15.
- No. 167. Company E: Typhoid fever, August 31; furloughed from Sternberg Hospital September 9.

SUMMARY.

Assembled at Camp Alvin Saunders, Lincoln, Nebr., April 27, 1898.

Mustered into United States service May 10, 1898.

Arrived at Chickamauga Park, Ga., May 22, 1898.

Strength on arrival, 1,020.

Date of first case of probable typhoid fever, May 26, 1898.

Date of first case of recognized typhoid fever, June 30, 1898.

Left Chickamauga Park, Ga., August 31, 1898.

Strength on departure, 1,303.

Number of cases of probable typhoid fever developed at Chickamauga 167

The record of this regiment stops with its leaving Chickamauga Park, Ga.

Total number of cases of probable typhoid fever developed in the Second Nebraska Volunteer Infantry from May to August, 1898 167

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These 167 cases were diagnosed as follows:

Typhoid fever.....	56
Malaria.....	82
Diarrhea.....	23
Enteritis.....	3
Gastritis.....	1
Intestinal colic.....	1
Dysentery.....	1
Total.....	167

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Brown, Harry E.....	Pvt., E.	1898. Sept. 11	Chickamauga, Ga.	Typhoid; acute hepatitis.
Burt, Oliver W.....	Pvt., K.	Oct. 8	Clay Center, Nebr.	Typhoid.
Cadwalader, Z. B.....	Pvt., (?)	Sept. 5	St. Louis, Mo.	Do.
Chaise, E. G.....	Artill., C.	Sept. 8	Fort Crook, Nebr.	Do.
Christy, C.....	Pvt., B.	Oct. 19	Omaha, Nebr.	Do.
Davis, Burt.....	Pvt., K.	Sept. 27	Schuyler, Nebr.	Do.
Drewing, John D.....	Pvt., E.	Sept. 8	Chickamauga, Ga.	Do.
Gregg, John K.....	Pvt., D.	Sept. 25	Lincoln, Nebr.	Do.
Hatch, C. M.....	Pvt., A.	Sept. 17	Fort Crook, Nebr.	Do.
Haydon, George A.....	Pvt., E.	Sept. 28	Omaha, Nebr.	Do.
Hedges, Thomas E.....	Corpl., I.	Aug. 28	Chattanooga, Tenn.	Do.
Hooper, E. H.....	2d Lt., K.	Sept. 11	Schuyler, Nebr.	Do.
Jenkins, Paul B.....	Pvt., A.	Sept. 17	Chickamauga, Ga.	Do.
Johnson, M. F.....	Pvt., G.	Sept. 16	Omaha, Nebr.	Do.
Jones, Edgar O.....	Pvt., H.	Oct. 25	St. Joseph's Hospital, Omaha, Nebr.	Do.
Kerum, Nathan J.....	Pvt., B.	Sept. 26	Ord, Nebr.	Do.
Krajciak, John.....	Pvt., E.	Aug. 18	Chattanooga, Tenn.	Do.
Kyriess, Chris.....	Pvt., L.	Sept. 20	Norfolk, Nebr.	Do.
Matthews, C. B.....	Pvt., I.	Sept. 27	Omaha, Nebr.	Do.
Norris, C. E.....	Pvt., M.	July 3	Grand Island, Nebr.	Appendicitis.
Plager, John W.....	Pvt., C.	Sept. 4	Fort Crook, Nebr.	Typhoid.
Pringley, W. B.....	Pvt., I.	Oct. 27	St. Joseph's Hospital, Omaha, Nebr.	Do.
Sawyer, Nelson A.....	Pvt., D.	July 3	Camp Thomas, Ga.	Maniacal chorea.
Sprague, Richard.....	Pvt., M.	Aug. 8	do	Typhoid.
Wiggins, N. Grant.....	Pvt., E.	Sept. 23	Fort Crook, Nebr.	Do.
Wilson, Eli A.....	Pvt., (?)	Oct. 13	do	Abscess of right lung.

Total deaths..... 26

Deaths due to typhoid fever..... 22

Percentage of deaths among probable cases (167) of typhoid fever, 13.17.

Percentage of deaths among recognized cases (56) of typhoid fever, 39.28.

It will be seen from these figures that it is not at all likely that we have obtained the full list of cases of typhoid fever.

Major Hoover states:

Second Nebraska National Guard assembled at Camp Alvin Saunders, Lincoln, Nebr., April 27, 1898. The weather was intensely cold and wet until May 8, and developed over 200 cases of acute tonsillitis, and more than 50 cases of diarrhea; about 30 cases of measles were reported while here. The above-named cases were taken from First and Second regiments, Nebraska National Guard. I was the only surgeon in charge. The cases of measles were in isolated tents and quarantined. The others rallied quickly, so that by May 10, the date of mustering into the United States service as volunteers, the majority had been assigned to duty. We were transferred to Chickamauga Park, Ga., arriving there May 22, being two days en route. We were assigned to the First Division, Second Brigade, Third Army Corps. Our camp was heavy with foliage and undergrowth, but was soon cleared and kept thoroughly policed during our stay. The main supply of water was from Chickamauga Creek, and after a couple of weeks iron pipes were laid on the surface and water carried by this means to the various camps, and often it was so hot that the horses would not drink it. Orders were given to have all water boiled that was used for drinking purposes, and later on a system of filtering the water was adopted, which proved a failure, as the amount of solid refuse was

so great as to render the filters useless. Part of the water was carried from Crawfish Springs, which was undoubtedly pure at first, but later became unfit for drinking. Then water was brought from Blue Springs. A small lake formed where the water was taken, and this was frequently contaminated by hogs, cattle, and mules wading, wallowing, and standing in same, but it was the best we had or could get. The water supply—i. e., good, pure water—was inadequate to the demand and very difficult to procure, and undoubtedly this was an important factor in the causation of typhoid fever and dysenteries.

The first month in camp our regiment was in good condition. A few cases of measles and diarrhea were all that answered to sick call. From about the 1st of July malaria in various degrees manifested itself with intermittent and remittent fevers, some of a pernicious type, simulating, in some respects, symptoms of typhoid, and in a great many instances were called typhoid.

Being assigned to command First Division, Third Army Corps Hospital June 1, and not returned to regiment until August 30, I can only report on cases received in same. About July 1 the first pronounced case of typhoid fever was received, where we had the characteristic lesion, and from then until our leaving camp quite a number of cases were received, but did not assume alarming proportions in comparison with malarial cases. Microscopical examinations of the blood were made in a number of suspected cases, and in a few instances showed characteristic lesions of typhoid. In every case of typhoid fever received in hospital during my command we had the eruptions plainly shown, in some cases the spots being very numerous and extending from pubes to the upper margin of the stomach. Delirium was manifest in all cases; but in the majority, of a mild form. Tympanites, subsultus tendinum, and pea-green stools were present in all cases, as was excessive thirst and occasional vomiting. Only in cases of intestinal hemorrhage did the patients die, all others recovering, the convalescing extending from two to five weeks. The death rate of typhoid fever in our hospital was very small, our greatest mortality occurring after returning to Fort Omaha, Nebr., where we arrived September 1 and remained until mustered out October 24. Our camp at Omaha was a good one from every standpoint, but the weather was cold and damp, and a great many cases developed.

The symptoms in these cases were about the same, and all died who had hemorrhages. A great many cases (so-called typhoid) were reported, but recovery took place in from three to four weeks, and in many instances these were cases of pernicious intermittent and remittent fevers, malaria, and jaundice, all with some pronounced symptoms of typhoid, but not the typhoid lesion. You will see from report of deaths, 20 were from pronounced typhoid, the other 8 from various causes. There were numerous factors that entered into the spread of this fever in the Georgia camp, some might have been averted entirely, some modified by change of camp early in the summer, but the main cause of same (the water supply) was a difficult one and could not be overcome except by removal of troops to some other camp. The number of cases treated from September 1 to October 24, inclusive, approximated about 200, of which number about 40 cases were of typhoid fever, and 8 deaths resulted from same. I am not sure as to whether it is 5 or 8 deaths from typhoid, as I have not the records. Some died after the regiment was mustered out, and no report was ever made to me of same after October 24.

COMMENT.

Major Hoover has sent us a corrected list of deaths in which the total number is the same, but he has changed the causes of death in several instances and, according to him, only 20 cases instead of 24 died of typhoid fever. He says that Harry Brown, of Company E, died of acute hepatitis. The records of Stern-

berg Hospital show that this man died of typhoid fever. He was received at Sternberg Hospital without regimental diagnosis August 30 and died September 11. Major Hoover reports that Chris Kyris died of heart lesion. It will be seen that this man died at Norfolk, Nebr., and the attending physician reported his death as due to typhoid fever. Major Hoover reports N. G. Wiggins as having died of appendicitis. The records of the hospital at Fort Crook report him as having died of typhoid fever.

SECOND NEW YORK VOLUNTEER INFANTRY.

Second Brigade, First Division, Third Army Corps.

This regiment was at Chickamauga Park, Ga., for only twelve days. It reached Chickamauga May 21 and departed June 1. From Chickamauga it went to Tampa, Fla., and became a part of the Second Brigade of the Second Division of the Fourth Army Corps.

The first report that we have of this regiment is for the month of June, and is signed by Asst. Surg. Henry C. Baum, who makes no comment.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,078
Typhoid fever.....	2
Indigestion.....	3
Gastritis.....	1
Undiagnosed.....	10
Malaria.....	1
Diarrhea.....	231
Injured by lightning.....	10
Other diseases and accidents.....	53
Total.....	311

The July report is also signed by Asst. Surg. Henry C. Baum without comment.

CONDENSED SICK REPORT FOR JULY.

Mean strength, not given.	
Typhoid fever.....	2
Malarial fever.....	19
Diarrhea.....	242
Other diseases and accidents.....	197
Total.....	460

The exact location of this regiment at Tampa is not given in any of the reports. It is stated that the sick were sent to the hospital at Tampa Heights.

In the August report Louis Balch, major and surgeon, makes the following statement:

The command moved from Tampa, Fla., to Fernandina, Fla., the latter part of July. The camp ground was much better and more healthy than the one at Tampa, but sickness still kept up to an alarming extent. Part of this, I think, may be attributed to the fact that the command had fallen into a highly nervous state, the presence of so many sick men in camp acting on the well as an exciting cause. Being retained in the fever belt had also its effect.

August 24 the command was ordered north to Troy, N. Y., and reached that place August 27, going into camp on the 28th and 29th at Averill Park, 12 miles out from Troy, on high rolling ground

about 800 to 900 feet above sea level. Here rapid improvement took place and while malaria still developed it was much less in amount. All cases requiring hospital treatment were removed to the hospitals in the city and the effect upon the command of not seeing so many sick crawling or lying about camp was marked. Catarrh and jaundice began to develop. Twelve cases died during the month; only two of these are noted in the text, the other deaths taking place at hospitals or at home.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,358
Typhoid fever.....	2
Malaria and malarial fever	258
Diarrhea	206
Constipation	22
Indigestion	26
Biliousness.....	2
Gastro-enteritis.....	1
Catarrh of stomach	2
Undiagnosed	20
Other diseases.....	153
Total	692

During the month of August 90 patients were transferred to the hospital.

The September report is signed by Major Balch, who makes the following statement:

Camp Hardin, at Averill Park, was on high ground, the camp being pitched on the crown of a knoll. The soil was a gravelly clay, water not sinking in rapidly after rain, but slowly evaporating, absorbing, or running off as the situation allowed.

Water taken from a stand pipe from Sand Lake was of good quality, having, however, a slight peaty taste. It was clear and clean. No chemical or biological examination of it was made. Nine more men were sent to hospital than appear upon this report. This may be partly accounted for by the fact that on the arrival of the regiment in Troy cases were at once sent to hospital, and as books and papers did not reach Camp Hardin until some days after the command (headquarters baggage car being lost in North Carolina), no record appears to have been properly kept of these cases.

Many men were allowed to go home on passess, being ill, and all record of them was lost. The deaths reported in summary are the number reported from hospitals and homes. Eight deaths were reported in October, making the total loss by death to the regiment 35.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,346
Typhoid fever.....	2
Malaria	28
Undiagnosed.....	5
Gastritis	3
Constipation	4
Diarrhea.....	34
Debility	2
Indigestion	5
Colitis	1
Other diseases.....	47
Total	131

The following is a list of the recognized and probable typhoid cases in this regiment. It should be stated, however, that in all probability this list is quite incomplete. This point will be discussed later:

No. 1. Company H: Intermittent malaria, June 1 to 12.

No. 2. Company M: Typhoid fever, June 11 to July 26.

No. 3. Company A: Diarrhea, June 13; still sick June 30.

No. 4. Hospital Corps: Typhoid fever, June 24; sent to Fort McPherson June 30.

No. 5. Company not given: Malaria, July 2; sent to division hospital August 8.

No. 6. Company G: Diarrhea, July 5 to 20.

No. 7. Company M: Malaria, July 9 to August 8.

No. 8. Company D: Typhoid fever, July 10; sent to hospital July 14.

No. 9. Company M: Typhoid fever, July 10; sent to hospital July 14.

No. 10. Company M: Malaria, July 12; sent to division hospital August 9.

No. 11. Company G: Malaria, July 13; sent to hospital at Tampa Heights July 13. There is no evidence that this man was ever returned to duty.

No. 12. Company D: Typhoid fever, July 14; died at Fort McPherson July 19.

No. 13. Company I: Malaria, July 16; sent to Fort Thomas July 18. Here the diagnosis was changed to typhoid fever and the patient was discharged October 5.

No. 14. Company M: Malaria, July 16; sent to Third Division Hospital, Fernandina, August 9. Here the disease was diagnosed typhoid fever and the patient was furloughed September 13.

No. 15. Company M: Malaria, July 17; sent to Fort Thomas July 22; transferred to Third Division Hospital August 9; furloughed September 10. At Fort Thomas this case was diagnosed typhoid fever.

No. 16. Company M: Typhoid fever, July 17; sent to division hospital at Fernandina August 9.

No. 17. Company M: Diarrhea and malaria, July 17; sent to division hospital at Fernandina August 9. Here the disease was diagnosed typhoid fever and the patient was furloughed August 17.

No. 18. Company K: Malaria, July 19; sent to hospital at Tampa Heights July 25; further disposition of this patient is not given.

No. 19. Company I: Malaria, July 19 to August 10.

No. 20. Company I: Malaria, July 19 to August 4.

No. 21. Company K: Diarrhea, July 19; sent to Fort Thomas July 29. Here the disease was diagnosed typhoid fever and the patient was furloughed August 28.

No. 22. Company I: Malaria, July 19; sent to Fort McPherson August 10. Here the disease was diagnosed typhoid fever. Further disposition not given.

No. 23. Company M: Malaria, July 19 to August 21.

No. 24. Company L: Malaria, July 20; sent to Fort McPherson July 21. Further disposition not given.

No. 25. Company H: Malaria, July 20; still sick in hospital at Tampa Heights July 31.

No. 26. Company not given: Malaria, July 20; died in regimental hospital at Fernandina July 31.

No. 27. Company F: Typhoid fever, July 22; furloughed July 26.

No. 28. Company M: Sent to hospital without date or diagnosis July 22. In hospital the case was diagnosed typhoid fever and the patient was furloughed August 6.

No. 29. Company M: Without date or diagnosis; sent to hospital July 22. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 25.

No. 30. Company D: Malaria, July 22; still sick at Fort Thomas July 31.

No. 31. Company M: Without date or diagnosis; sent to Fort Thomas July 22. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 18.

No. 32. Company E: Malaria, July 23; still sick in division hospital July 31.

No. 33. Company K: Malaria, July 23; sent to hospital July 24; transferred to Fort Thomas July 29; furloughed September 21.

No. 34. Company H: Malaria, July 25; sent to Second Division Hospital at Fernandina July 28; further disposition is not given.

It might be remarked here that all of the records of the division hospital at Fernandina were destroyed in a storm.

No. 35. Company M: Malaria, July 26; sent to Third Division Hospital at Fernandina August 9.

No. 36. Company D: Malaria, July 27; sent to Third Division Hospital at Fernandina July 30.

No. 37. Company I: Malaria, July 28; sent to hospital at Troy August 28.

No. 38. Company M: Typhoid fever, July 28; sent to division hospital at Fernandina July 30; transferred to Fort Thomas August 20; furloughed September 13.

No. 39. Company L: Malaria, July 29; sent to Third Division Hospital at Fernandina August 1.

No. 40. Company C: Malaria, July 29; sent to division hospital at Fernandina August 7.

No. 41. Company C: Malaria, July 29; furloughed August 17.

No. 42. Company L: Malaria, July 29; still sick at Fernandina August 31.

No. 43. Company K: Diarrhea, July 29; still sick August 14.

No. 44. Company D: Malaria, July 29; furloughed September 9.

No. 45. Company I: Malaria, July 29; furloughed September 9.

No. 46. Company I: Malaria, July 30; sent to Fort McPherson August 1. Here the disease was diagnosed typhoid fever, and the further disposition of this patient is not given.

No. 47. Company D: Malaria, July 30; died at Fort McPherson August 8.

No. 48. Company L: Malaria, July 30; died at Fernandina July 31.

No. 49. Company H: Malaria, July 31; still sick August 31.

No. 50. Company L: Typhoid fever, July 31; furloughed August 7.

No. 51. Company F: Typhoid fever, July 31; sent home on train August 7.

No. 52. Company K: Malaria, July 31; still sick at Fernandina August 31.

No. 53. Company D: Typhoid fever, July 31; furloughed without date.

No. 54. Company H: Malaria, July 31; furloughed August 10.

No. 55. Company D: Malaria, July 31; furloughed August 10.

No. 56. Company I: Malaria, July 31; discharged from hospital October 14.

No. 57. Company C: Malaria, August 1; still sick at Fernandina August 31.

No. 58. Company I: Malaria, August 1; still sick at home August 31.

No. 59. Company F: Diarrhea, August 1; furloughed August 15.

No. 60. Company C: Diarrhea, August 1; still sick at Fernandina August 31.

No. 61. Company C: Continued fever, August 1; furloughed August 25.

No. 62. Company I: Malaria, August 1; sent to Fort Thomas August 10. Here the disease was diagnosed typhoid fever, and the patient was discharged October 14.

No. 63. Company A: Malaria, August 2; sent to Fort McPherson August 8.

No. 64. Company L: Malaria, August 2; still sick at Fernandina August 31.

No. 65. Company K: Malaria, August 2; still sick at Fernandina August 31.

No. 66. Company M: Typhoid fever, August 3; died August 9.

No. 67. Company L: Malaria, August 3; still sick at Fernandina August 31.

No. 68. Company C: Malaria, August 3; sent to Fort McPherson August 10.

No. 69. Company E: Malaria, August 3; still sick at Fernandina August 31.

No. 70. Company B: Malaria, August 4; still sick at Fernandina August 31.

No. 71. Company L: Malaria, August 4; still sick at Fernandina August 31.

No. 72. Company M: Continued fever, August 5; furloughed September 7.

No. 73. Company I: Malaria, August 5; still sick at Fernandina August 31.

No. 74. Company K: Diarrhea, August 5; furloughed August 17.

No. 75. Company M: Malaria, August 6; still sick at Fernandina August 31.

No. 76. Company M: Malaria, August 6; furloughed August 23.

No. 77. Company K: Malaria, August 6; still sick at Fernandina August 31.

No. 78. Company A: Diarrhea, August 6; still sick at home August 31.

No. 79. Company A: Typhoid fever, August 6; furloughed August 13.

No. 80. Company B: Typhoid fever, August 7; disposition not given.

No. 81. Company B: Malaria, August 7; still sick in hospital August 31.

No. 82. Company D: Malaria, August 8; still sick at Fernandina August 31.

No. 83. Company K: Malaria, August 8; still sick at Fernandina August 31.

No. 84. Company D: Malaria, August 8; still sick at Fernandina August 31.

No. 85. Company C: Malaria, August 8; still sick at Fernandina August 31.

No. 86. Company E: Malaria, August 8; still sick at Fernandina August 31.

No. 87. Company H: Malaria, August 8; still sick at Fernandina August 31.

No. 88. Company C: Malaria, August 8; still sick at Convent Hospital, Fernandina August 31.

No. 89. Company D: Malaria, August 8; still sick at Fernandina August 31.

No. 90. Company K: Malaria, August 9; still sick at Fernandina August 31.

No. 91. Company L: Malaria, August 9; sent to division hospital at Fernandina August 14.

No. 92. Company D: Malaria, August 10; sent to division hospital at Fernandina August 13.

No. 93. Company L: Malaria, August 10; sent to division hospital at Fernandina August 20.

No. 94. Company L: Diarrhea, August 11; still sick at Fernandina August 31.

No. 95. Company C: Diarrhea, August 11; furloughed August 23.

No. 96. Company H: Malaria, August 11; sent to hospital at Fernandina August 16.

No. 97. Company H: Diarrhea, August 11; sent to hospital at Fernandina August 15; transferred to Fort Thomas August 20. Here the disease was diagnosed typhoid fever, and the patient was discharged October 14.

No. 98. Company K: Malaria, August 12; sent to division hospital at Fernandina August 15.

No. 99. Company F: Malaria, August 12; sent to division hospital at Fernandina August 15.

No. 100. Company F: Malaria, August 13; sent to division hospital at Fernandina August 15.

No. 101. Company F: Malaria, August 13; furloughed August 25.

No. 102. Company L: Malaria, August 13; sent to division hospital at Fernandina August 20.

No. 103. Company E: Undiagnosed, August 13; furloughed August 23.

No. 104. Company F: Diarrhea, August 13; furloughed August 25.

No. 105. Company A: Malaria, August 13; died at home August 27.

No. 106. Company F: Diarrhea, August 13; furloughed August 23.

No. 107. Company F: Malaria, August 13; sent to division hospital August 15; transferred to Fort Thomas August 20. Here the disease was diagnosed typhoid fever, and the patient was discharged October 14.

No. 108. Company D: Malaria, August 14; sent to division hospital at Fernandina August 16.

No. 109. Company K: Malaria, August 14; sent to division hospital at Fernandina August 15. There is no record that any of these cases were ever returned to duty.

No. 110. Company I: Malaria, August 14; still sick at home August 31.

No. 111. Company D: Malaria, August 14; sent to division hospital at Fernandina August 22.

No. 112. Company I: Malaria, August 15; sent to division hospital at Fernandina August 24.

No. 113. Company A: Malaria, August 15; furloughed August 18.

No. 114. Company E: Malaria, August 15; sent to division hospital at Fernandina August 28.

No. 115. Company D: Malaria, August 15; sent to division hospital at Fernandina August 16.

No. 116. Company H: Malaria, August 15; sent to division hospital at Fernandina August 16.

No. 117. Company H: Diarrhea, August 15; sent to division hospital at Fernandina August 17.

No. 118. Company M: Malaria, August 16; sent to division hospital at Fernandina August 21.

No. 119. Company L: Malaria, August 16; sent to division hospital at Fernandina without date.

No. 120. Company I: Diarrhea, August 17; furloughed August 31.

No. 121. Company I: Malaria, August 17; furloughed August 30.

No. 122. Company L: Malaria, August 18; sent to division hospital at Fernandina.

No. 123. Company I: Malaria, August 18; sent to division hospital at Fernandina August 24.

No. 124. Company M: Malaria, without date; sent to Fort Thomas August 20. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 20.

No. 125. Company M: Malaria, without date; sent to Fort Thomas August 20. Here the disease was diagnosed typhoid fever, and the patient was furloughed without date.

No. 126. Company D: Diarrhea, August 20; furloughed without date.

No. 127. Company A: Malaria, August 20; sent to division hospital at Fernandina August 24.

No. 128. Company D: Malaria, August 20; sent to Fort Thomas September 3. Here the disease was diagnosed typhoid fever, and the patient was discharged October 19.

No. 129. Company D: Malaria, August 20; furloughed without date.

No. 130. Company not given: Malaria, August 20; furloughed August 27.

No. 131. Company L: Malaria, August 20; sent to hospital at Troy August 28.

No. 132. Company E: Malaria, August 20; sent to division hospital at Fernandina August 23.

No. 133. Company L: Malaria, August 20; sent to division hospital at Fernandina August 24.

No. 134. Company L: Without date or diagnosis; sent to Fort Thomas August 20. Here the disease was diagnosed typhoid fever, and the patient was discharged October 9.

No. 135. Company A: Malaria, August 20; sent to division hospital at Fernandina August 24.

No. 136. Company D: Without date or diagnosis; sent to Fort Thomas August 20. Here the disease was diagnosed typhoid fever, and the patient was discharged October 18.

No. 137. Company F: Malaria, August 21; sent to hospital at Troy August 30.

No. 138. Company I: Malaria, August 21; furloughed August 31.

No. 139. Company A: Malaria, August 23; sent to hospital at Troy August 27.

No. 140. Company E: Continued fever, August 24; furloughed September 20.

No. 141. Company I: Malaria, August 29; still sick at home September 30.

No. 142. Company I: Malaria, August 29; still sick at home September 30.

No. 143. Company I: Malaria, August 29; sent to hospital at Troy August 31.

No. 144. Company C: Typhoid fever, September 1; sent to hospital at Troy September 3.

No. 145. Company D: Typhoid fever, September 5; disposition not given.

No. 146. Company I: Malaria, September 7; sent to hospital at Troy September 13.

No. 147. Staff: Malaria, September 7; sent to hospital at Troy September 10.

No. 148. Company I: Malaria, September 7; sent to Fort Thomas September 7. Here the disease was diagnosed typhoid fever and the patient was discharged October 29.

No. 149. Company K: Without date or diagnosis; sent to Fort Thomas September 7. Here the disease was diagnosed typhoid fever and the patient was discharged October 29.

No. 150. Company I: Without date or diagnosis; sent to Fort Thomas September 7. Here the disease was diagnosed typhoid fever and the patient was discharged October 14.

No. 151. Company M: Without date or diagnosis; sent to Fort Thomas September 7. Here the disease was diagnosed typhoid fever and the patient was discharged October 19.

No. 152. Company K: Without date or diagnosis; sent to Fort Thomas September 7. Here the disease was diagnosed typhoid fever and the patient was discharged October 14.

No. 153. Company D: Without date or diagnosis; sent to Fort Thomas September 7. Here the disease was diagnosed typhoid fever and the patient was discharged November 3.

No. 154. Company H: Without date or diagnosis; sent to Fort Thomas September 7. Here the disease was diagnosed malaria and the patient was discharged October 14.

No. 155. Company K: Without date or diagnosis; sent to Fort Thomas September 7. Here the disease was diagnosed typhoid fever and the patient was discharged October 14.

No. 156. Company H: Without date or diagnosis; sent to Fort Thomas September 7. Here the disease was diagnosed malaria and the patient was discharged October 14.

No. 157. Company D: Typhoid fever, September 28; died October 3.

No. 158. Company M: Typhoid fever, September 28; furloughed September 30.

No. 159. Company F: Typhoid fever, September 28; furloughed October 1.

No. 160. Company D: Typhoid fever, September 28; furloughed October 23.

No. 161. Company E: Typhoid fever, September 28; furloughed September 30.

SUMMARY.

Assembled at Peeskill.

Mustered into United States service May 8, 1898.

Arrived at Chickamauga Park, Ga., May 21, 1898.

Strength on arrival, 1,078.

Date of first case of probable typhoid fever, June 1, 1898.

Date of first case of recognized typhoid fever, June 11, 1898.

Left Chickamauga Park, Ga., June 1, 1898.

Strength on departure, 1,014.

Number of cases of probable typhoid fever developed at Chickamauga..... 1

Arrived at Tampa, Fla., about June 3, 1898.

Left Tampa, Fla., about July 20, 1898.

Number of cases of probable typhoid fever developed at Tampa, Fla..... 24

Arrived at Fernandina, Fla., about July 20, 1898.

Left Fernandina, Fla., August 24, 1898.

Number of cases of probable typhoid fever developed at Fernandina, Fla.....	115
Arrived at Troy, N. Y., August 27, 1898.	
Number of cases of probable typhoid fever developed after reaching Troy, N. Y.....	21
Total number of cases of probable typhoid fever developed in the Second New York Volunteer Infantry, from May to September, 1898.....	161
These 161 cases were diagnosed as follows:	
Typhoid fever.....	46
Malaria.....	98
Continued fever.....	3
Diarrhea.....	13
Undiagnosed.....	1
Total.....	161

The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Allen, Charles W.....	Pvt., M	Aug. 9	Fort McPherson, Ga.	Typhoid.
Bahme, Felix W.....	Pvt., D	Sept. 1	Fernandina, Fla.....	Do.
Baker, Charles N.....	Pvt., C	Aug. 9	Atlanta, Ga.....	Do.
Blakely, Andrew W.....	Pvt., D	Oct. 22	Fort McPherson, Ga.	Do.
Chapel, Herbert S.....	Pvt., M	Sept. 9	Fernandina, Fla.....	Do.
Daniels, Frank H.....	Pvt., E	Oct. 1	.....	Pneumonia.
Dewey, Frank.....	Pvt., D	Sept. 7	Fernandina, Fla.....	Typhoid.
Hayner, Horatio H.....	Corpl., A	Sept. 20	Troy, N. Y.....	Do.
Holden, James A.....	Pvt., L	Sept. 13	.....do.....	Do.
Jessup, F. W.....	Pvt., D	Sept. 27	.....do.....	Do.
Jourdan, Elmer J.....	Pvt., L	Aug. 16	Fort McPherson, Ga.	Do.
Kennedy, W. S.....	Pvt., A	Aug. 28	Troy, N. Y.....	Do.
Legnard, Frank S.....	Pvt., L	July 31	Fernandina, Fla.....	(Typhoid); convulsions.
MacArthur, W. H.....	Pvt., A	Aug. 18	.....do.....	Intestinal hemorrhage, resulting from typhoid.
McNair, F. P.....	Corpl., L	Oct. 18	Saratoga Springs, N. Y.	Typhoid malaria.
McNamara, T. W.....	Pvt., L	Sept. 7	Troy, N. Y.....	Typhoid.
Morrison, C. H.....	Pvt., D	Aug. 10	Fort McPherson, Ga.	Do.
Nellis, Webster W.....	Pvt., H	Sept. 21	Amsterdam, N. Y.....	Do.
O'Brien, Michael J.....	Pvt., C	Aug. 19	Fernandina, Fla.....	Do.
Olena, Edgar J.....	Pvt., D	Sept. 4	Troy, N. Y.....	Do.
Parker, R. A.....	Pvt., L	Sept. 5	Fernandina, Fla.....	Do.
Parks, Frank L.....	Corpl., K	Oct. 13	South Glens Falls, N. Y.	Do.
Powers, Auer E.....	Pvt., M	Aug. 21	Fort McPherson, Ga.	Do.
Putnam, Frank A.....	Pvt., L	Aug. 31	Fernandina, Fla.....	Do.
Roach, Royal T.....	Pvt., K	Oct. 23	Saratoga Springs, N. Y.	Do.
Searing, W. J.....	Pvt., L	Aug. 19	Fernandina, Fla.....	Do.
Thayer, Charles L.....	Pvt., D	July 19	Fort McPherson, Ga.	Do.
West, Tracey E.....	Pvt., L	Aug. 7	Fernandina, Fla.....	Do.
Wilson, Warren A.....	Pvt., K	Aug. 30	Fort McPherson, Ga.	Do.
Woodcock, S. C.....	Corpl., A	Oct. 4	Troy, N. Y.....	Do.
Wylie, John L.....	Sgt., D	Aug. 25	Fernandina, Fla.....	Do.

Total deaths.....	31
Deaths due to typhoid fever.....	30
Percentage of deaths among probable cases (161) of typhoid fever, 18.63.	
Percentage of deaths among recognized cases (46) of typhoid fever, 65.21.	

It will be readily seen from these figures that we have not obtained a complete list of cases of typhoid fever in this regiment.

THIRD TENNESSEE VOLUNTEER INFANTRY.

Third Brigade, First Division, Third Army Corps.

In the May report Maj. William Bowen, surgeon in charge, makes the following statement:

On May 5, 1898, Maj. William Bowen and Capt. George Manning were mustered in at Nashville, Tenn., as surgeon and assistant

surgeon of the Third Regiment of Tennessee Volunteers. They were immediately placed on duty as examining surgeons, under command of Major Carter, U. S. Army, and served under his orders until the regiment left for Chickamauga, May 23, 1898. The regiment arrived at Camp George H. Thomas May 24, 1898. On May 27, Captain Ellis went to Chattanooga on sick leave granted by Major Bowen, approved by Col. J. P. Fyffe, regimental commander, and recent reports from his attending physician show him to be seriously ill. No second assistant surgeon has yet been mustered into the regiment. The health of the regiment has been admirable, considering the fact that nearly all the men are new to the diet and exposure of campaign life. Several incompetent men succeeded in passing the examining board at Nashville, Tenn., and discharges for disability will be recommended for them as soon as possible. The water supply of the camp is poor. The water is warm and is contaminated by bathing and excrement in the creek above the source of the supply.

CONDENSED SICK REPORT FOR MAY.

Mean strength.....	997
Acute diarrhea.....	25
Intermittent malaria.....	2
Subacute gastritis.....	3
Acute dysentery.....	2
Gastro-enteritis.....	1
Other diseases.....	32
Total.....	65

In the June report Major Bowen states:

The large percentage of diarrhea is due largely to drinking water after heavy exercise in the sun.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,174
Typhoid fever.....	1
Intermittent malaria.....	7
Remittent malaria.....	4
Acute diarrhea.....	41
Acute dysentery.....	3
Acute enteritis.....	3
Subacute enteritis.....	1
Acute gastritis.....	2
Subacute gastritis.....	2
Acute intestinal colic.....	1
Other diseases.....	125
Total.....	190

In the July report Major Bowen states:

The number of cases of typhoid fever is, in my opinion, due rather to general climatic conditions than to any unhygienic or unsanitary state of affairs. Remittent malarial fevers are frequently present in this section throughout the rainy season. The small number of cases of mumps and measles tend to show that conditions favoring infection and contagion are at a minimum. Coryza, pharyngitis, bronchitis, rheumatism, and neuralgia have been quite prominent, largely owing to the fact that the shelter furnished the men has been very imperfect and the atmosphere very humid.

CONDENSED SICK REPORT FOR JULY.

Mean strength.....	1,297
Typhoid fever.....	15
Intermittent malaria.....	4
Remittent malaria.....	26

Acute diarrhea	28
Acute dysentery	8
Subacute enteritis	1
Subacute gastritis	3
Acute dyspepsia	1
Gastric and intestinal indigestion	3
Hepatic engorgement	19
Other diseases	80
Total	188

From the August report we have failed to extract anything more than the following general numerical data:

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,191
Admissions:	
Remaining from last month	35
From command	419
Total	454
Returned to duty	388
Died	5
Transferred to other hospitals	20
Total	413
Remaining on sick report:	
Hospital	413
Quarters	41

There are no comments made on this report.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,198
Admissions:	
Remaining from last month	58
From command	338
Total	396
Returned to duty	352
Died	1
Transferred to other hospitals	10
Total	363
Remaining on sick report:	
Hospital	10
Quarters	23

On September 5 this regiment left Chickamauga Park, Ga., and went to Anniston, Ala.

In the October report Major Bowen states:

The large number of cases of measles and mumps prevailing in the command is due to the fact that a majority of the men composing the regiment were raised in the mountains and thus not exposed to these diseases during childhood.

We have no numerical data from the reports for October and November.

In November Major Bowen states:

The health of the command has been remarkably good. The few cases in the division hospital were mostly measles and mumps. There is now neither typhoid nor malarial fever in the regiment. The regimental hospital answers admirably the purpose for which it was instituted. Many cases after a few days detention can be returned to duty. These might have become seriously ill if left in quarters.

The following is a list of the probable cases of typhoid fever in this regiment:

- No. 1. Company F: Malarial fever, June 9 to July 10.
- No. 2. Company M: Typhoid fever, June 16; disposition not given.
- No. 3. Company E: Intermittent malaria, June 16; disposition not given.
- No. 4. Company E: Intermittent malaria, June 20; still sick July 31.
- No. 5. Company E: Intermittent malaria, June 26; still sick July 31.
- No. 6. Company D: Typhoid fever, July 2; sent to Fort McPherson July 24.
- No. 7. Company E: Typhoid fever, July 4; furloughed July 29.
- No. 8. Company K: Typhoid fever, July 4; furloughed August 1.
- No. 9. Company H: Subacute gastritis, July 4 to 22.
- No. 10. Company A: Remittent malaria, July 5; furloughed July 16.
- No. 11. Company G: Intermittent malaria, July 5; still sick July 31.
- No. 12. Company E: Typhoid fever, July 7; still sick in division hospital July 31.
- No. 13. Company E: Remittent malaria, July 8; still sick in division hospital July 31.
- No. 14. Company G: Intermittent malaria, July 9; still sick July 31.
- No. 15. Company D: Remittent malaria, July 10 to 23.
- No. 16. Company D: Typhoid fever, July 12; still sick in division hospital July 31.
- No. 17. Company E: Typhoid fever, July 14; still sick in division hospital July 31.
- No. 18. Company C: Intermittent malaria, July 15; still sick July 31.
- No. 19. Company E: Intermittent malaria, July 16; furloughed July 25.
- No. 20. Company C: Typhoid fever, July 17; still sick in division hospital July 31.
- No. 21. Company B: Diarrhea, July 19 to 30.
- No. 22. Company B: Typhoid fever, July 20; furloughed from Leiter Hospital August 23.
- No. 23. Company D: Typhoid fever, July 21; furloughed July 24.
- No. 24. Company C: Remittent malaria, July 23; furloughed August 1.
- No. 25. Company C: Remittent malaria, July 23; furloughed August 5.
- No. 26. Company H: Typhoid fever, July 23; furloughed August 26.
- No. 27. Band: Typhoid fever, July 24; died August 1.
- No. 28. Band: Typhoid fever, July 26; furloughed August 26.
- No. 29. Company G: Typhoid fever, July 27; disposition not given.
- No. 30. Band: Remittent malaria, July 27; furloughed August 14.
- No. 31. Company D: Remittent malaria, July 29; furloughed August 8.
- No. 32. Company F: Remittent malaria, July 29; still sick August 31.
- No. 33. Company I: Remittent malaria, July 29; still sick August 31.
- No. 34. Company B: Typhoid fever, July 30; furloughed August 3.
- No. 35. Company C: Typhoid fever, July 31; disposition not given.
- No. 36. Company G: Typhoid fever, August 1; furloughed August 23.
- No. 37. Company H: Typhoid fever, August 1; died October 9.
- No. 38. Company D: Remittent malaria, August 1; furloughed August 13.

No. 39. Company D: Remittent malaria, August 1; furloughed August 13.

No. 40. Company F: Remittent malaria, August 3; furloughed August 8.

No. 41. Company K: Typhoid fever, August 3; furloughed from Sternberg Hospital August 19.

No. 42. Band: Remittent malaria, August 3; furloughed August 15.

No. 43. Company G: Remittent malaria, August 3; furloughed August 23.

No. 44. Company G: Typhoid fever, August 3; furloughed August 11.

No. 45. Company C: Remittent malaria, August 3; furloughed August 14.

No. 46. Company L: Remittent malaria, August 3; furloughed August 15.

No. 47. Company H: Typhoid fever, August 3; died August 9.

No. 48. Company G: Typhoid fever, August 3; furloughed August 11.

No. 49. Company E: Typhoid fever, August 3; died August 17.

No. 50. Company E: Typhoid fever, August 3; died August 17.

No. 51. Company K: Remittent malaria, August 5; furloughed August 11.

No. 52. Company H: Remittent malaria, August 6; furloughed August 23.

No. 53. Company D: Remittent malaria, August 8; furloughed August 25.

No. 54. Company E: Typhoid fever, August 8; furloughed August 30.

No. 55. Company D: Typhoid fever, August 10; disposition not given.

No. 56. Company F: Remittent malaria, August 10; furloughed August 31.

No. 57. Band: Remittent malaria, August 11; furloughed August 23.

No. 58. Company E: Typhoid fever, August 11; furloughed from Sternberg Hospital October 4.

No. 59. Company C: Remittent malaria, August 11; furloughed August 29.

No. 60. Company B: Typhoid fever, August 11; still sick in Sternberg Hospital August 31.

No. 61. Company E: Remittent malaria, August 12; still sick in Sternberg Hospital August 31.

No. 62. Company H: Remittent malaria, August 12; furloughed August 19.

No. 63. Company C: Remittent malaria, August 12; furloughed August 23.

No. 64. Company E: Typhoid fever, August 12; furloughed from Sternburg Hospital September 3.

No. 65. Company H: Typhoid fever, August 12; furloughed August 30.

No. 66. Company L: Remittent malaria, August 12 to 30.

No. 67. Company L: Remittent malaria, August 12 to 26.

No. 68. Company D: Remittent malaria, August 13; furloughed August 23.

No. 69. Company G: Remittent malaria, August 15; furloughed August 30.

No. 70. Company B: Remittent malaria, August 15; furloughed August 30.

No. 71. Company B: Remittent malaria, August 17; furloughed August 23.

No. 72. Company K: Remittent malaria, August 17; furloughed August 20.

No. 73. Company B: Remittent malaria, August 17; furloughed August 23.

No. 74. Company K: Typhoid fever, August 18 to October 1.

No. 75. Company B: Remittent malaria, August 18; furloughed August 29.

No. 76. Company D: Typhoid fever, August 18; died in Sternberg Hospital October 6.

No. 77. Company K: Typhoid fever, August 19; still sick in Sternberg Hospital August 30.

No. 78. Company C: Typhoid fever, August 19; furloughed from Sternberg Hospital September 10.

No. 79. Company G: Remittent malaria, August 19; furloughed August 30.

No. 80. Company B: Remittent malaria, August 19; furloughed August 30.

No. 81. Company D: Remittent malaria, August 19; furloughed August 30.

No. 82. Company A: Remittent malaria, August 19; furloughed August 26.

No. 83. Company F: Remittent malaria, August 20; still sick in Sternberg Hospital in September.

No. 84. Company B: Remittent malaria, August 20; furloughed August 22.

No. 85. Company M: Typhoid fever, August 20; furloughed August 23.

No. 86. Band: Remittent malaria, August 20; furloughed August 23.

No. 87. Company A: Typhoid fever, August 20; furloughed from Sternberg Hospital September 23.

No. 88. Company K: Typhoid fever, August 20; furloughed September 22.

No. 89. Company B: Typhoid fever, August 20; still sick in Sternberg Hospital in September.

No. 90. Company F: Remittent malaria, August 20; furloughed August 27.

No. 91. Company I: Typhoid fever, August 21; still sick in Sternberg Hospital in September.

No. 92. Company E: Typhoid fever, August 23; furloughed September 10.

No. 93. Company H: Typhoid fever, August 23; still sick in Sternberg Hospital in September.

No. 94. Company F: Typhoid fever, August 23; furloughed August 27.

No. 95. Company A: Typhoid fever, August 25; still sick in Sternberg Hospital in September.

No. 96. Company E: Typhoid fever, August 26; furloughed from Sternberg Hospital October 15.

No. 97. Company L: Typhoid fever, August 29; furloughed from Sternberg Hospital November 14.

No. 98. Company I: Typhoid fever, August 30; furloughed November 5.

No. 99. Company K: Typhoid fever, August 30; furloughed from Sternberg Hospital September 5.

No. 100. Company A: Typhoid fever, August 30; furloughed from Sternberg Hospital September 9.

No. 101. Company M: Typhoid fever, August 30; furloughed from Sternberg Hospital October 20.

No. 102. Company B: Typhoid fever, September 4; furloughed from Sternberg Hospital September 17.

No. 103. Company E: Typhoid fever, September 4; furloughed from Sternberg Hospital September 17.

No. 104. Company I: Typhoid fever, September 4; died in Sternberg Hospital September 23.

No. 105. Company E: Typhoid fever, September 4; furloughed from Sternberg Hospital September 23.

No. 106. Company F: Typhoid fever, September 5; furloughed from Sternberg Hospital September 13.

No. 107. Company K: Typhoid fever, September 6; furloughed from Sternberg Hospital September 26.

No. 108. Company K: Typhoid fever, September 11; furloughed from division hospital September 19.

No. 109. Company A: Typhoid fever, September 15; disposition not given.

No. 110. Company B: Remittent malaria, September 20; furloughed September 30.

No. 111. Company K: Remittent malaria, September 21 to October 31.

No. 112. Company A: Remittent malaria, September 21; furloughed from division hospital October 31.

No. 113. Company C: Remittent malaria, September 24; furloughed from hospital October 18.

No. 114. Company B: Malarial fever, October 5; discharged from Fort Thomas December 17.

No. 115. Company B: Malaria, October 5; discharged from Fort Thomas December 17.

No. 116. Company I: Typhoid fever, October 9; furloughed November 11. This man is recorded as being convalescing from typhoid fever, but his name does not occur upon any previous record.

No. 117. Company C: Malarial fever, October 9 to 24.

No. 118. Company I: Typhoid fever, October 10; furloughed October 16.

No. 119. Company D: Typhoid fever, October 13; furloughed October 16. This man is recorded as being convalescing from typhoid fever, but his name can not be found on any previous record.

No. 120. Company F: Typhoid fever, October 15. This man is recorded as being received from Leiter Hospital and as convalescing from typhoid fever, but his name does not occur upon any previous record.

No. 121. Company A: Remittent malaria, October 26 to November 10.

No. 122. Company B: Typhoid fever, October 29; furloughed October 30.

No. 123. Company G: Remittent malaria, October 30; furloughed November 10.

SUMMARY.

Assembled at Nashville, Tenn., in April, 1898.	
Mustered into United States service May 5, 1898.	
Arrived at Chickamauga Park, Ga., May 24, 1898.	
Strength on arrival, 997.	
Date of first case of probable typhoid fever June 9, 1898.	
Date of first case of recognized typhoid fever June 16, 1898.	
Left Chickamauga Park, Ga., September 5, 1898.	
Strength on departure, 1,293.	
Number of cases of probable typhoid fever developed at Chickamauga	106
Arrived at Anniston, Ala., September 6, 1898.	
Number of cases of probable typhoid fever developed after reaching Anniston, Ala.	17
Total number of cases of probable typhoid fever developed in the Third Tennessee Volunteer Infantry from May to September, 1898.	123

It will be seen that in the above summary we have not taken the case of Captain Ellis as the first probable case of typhoid fever. By turning back to the May report by Major Bowen it will be seen that Captain Ellis was taken sick May 27 and sent to Chattanooga, where he became quite seriously ill. The nature of the illness is not given, and we have therefore not included it in our list of typhoid cases.

These 123 cases were diagnosed as follows:

Typhoid fever	61
Malaria	60
Subacute gastritis	1
Diarrhea	1
Total	123

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Dyer, Hugh W.	Pvt., M.	1898, Sept. 22	Chickamauga Park, Ga.	Typhoid; complication, measles.
Ford, William E.	Sgt., H.	Aug. 3	Chattanooga, Tenn.	Typhoid.
Francis, R. W.	Pvt., G.	Sept. 15	Anniston, Ala.	Pneumonia.
French, L. A.	Pvt., C.	Sept. 19	Piedmont, Tenn.	Typhoid.
Geil, Joseph T.	Band.	Aug. 1	Chickamauga, Ga.	Do.
Hughes, Samuel	Pvt., D.	Oct. 6	do	Typhoid; chronic dysentery.
Jackson, C. R.	Pvt., L.	Nov. 21	Near Wartburg, Tenn.	Consumption.
McCrosky, R. B.	Corpl., F.	Sept. 20	Camp Shipp, Ala.	Cerebro-spinal meningitis.
Perkey, David E.	Pvt., B.	Oct. 11	Anniston, Ala.	Typhoid.
Plemmons, J. L.	Pvt., M.	Sept. 6	Chattanooga, Tenn.	Typhoid; malarial remittent.
Priece, William	Pvt., D.	Sept. 30	do	Typhoid fever.
Richmond, Lester E.	Pvt., E.	Aug. 14	Inman, Tenn.	Typhoid.
Shoemaker, S. D.	Corpl., A.	Jan. 30	Camp Shipp, Ala.	Pneumonia.
Smith, Will.	Pvt., A.	Oct. 10	do	Typhoid.
Steepe, Nathan F.	Pvt., K.	Aug. 25	Camp Thomas, Ga.	Meningitis.
Sweet, Charles	Pvt., H.	Aug. 9	Chickamauga, Ga.	Typhoid.
Tilghman, J. C.	Pvt., E.	Aug. 17	Hill City, Tenn.	Do.
Triplet, R. S., jr.	2d Lt., M.	Sept. 21	Anniston, Ala.	Cerebral meningitis.
Troutman, John B.	Corpl., K.	Sept. 12	Camp Shipp, Ala.	Bronchial pneumonia.

Total deaths	19
Deaths from typhoid fever	12

Percentage of deaths among probable cases (123) of typhoid fever, 9.75.

Percentage of deaths among recognized cases (61) of typhoid fever, 19.67.

COMMUNICATIONS FROM THE SURGEONS OF THE THIRD TENNESSEE VOLUNTEER INFANTRY.

Medical officers.

William Bowen, major and surgeon, Knoxville, Tenn.

George W. Roberts, captain and assistant surgeon, Knoxville, Tenn.

Claude C. Pierce, lieutenant and assistant surgeon, Chattanooga, Tenn.

Under date of July 18, 1899, Lieutenant Pierce sends us the following statement:

While camped at Nashville, the mobilization point for Tennessee troops, the water supply was derived partly from a spring whose outlet was slightly below the level of the camp, partly from a well some 30 feet deep, and partly from the city supply pipes from the State penitentiary, which was near.

At this place sinks were dug to a depth of 10 feet in a soft and loamy soil, with a clay subsoil.

While camped at Chickamauga the water supply was derived from Chickamauga Creek. This water was not filtered and was distributed to the various regiments in surface pipes exposed to the sun. At no place near our camp at Chickamauga could sinks be dug much deeper than 4 feet, as at this depth solid limestone was encountered. Waste from the kitchen was dumped into similar sinks and was covered with earth. Tents were daily rolled up for ventilation and the company streets were thoroughly policed. Excreta from patients was emptied into special sinks and a strong solution of bichloride of mercury was used in the bedpans. The rain caused the overflow of certain sinks. Myriads of flies infested all parts of the camp, especially around the sinks and kitchens.

At Anniston, Ala., the sinks were dug to a depth of 12 feet and were prepared before the arrival of the regiment, which was not the case at Chickamauga. Kitchen slops were placed in covered, water-tight barrels, and were removed daily by employees of the quartermaster's department to a distance of 2 miles or more and

were disposed of by feeding to hogs. The regiment remained at Anniston from September 1, 1898, to February 1, 1899, when it was mustered out of service.

Major Bowen states:

In July, 1898, there were 15 cases of typhoid fever. These cases were undoubted and, in the light of my present experience, I would say were largely due to drinking of surface water, inadequate sinks, and flies.

In August and September typhoid continued to show up, and may be attributed to similar causes as in July. The sinks could never be satisfactorily closed. The proximity of sinks to kitchens caused the food to become infected by the flies, and the poor water supplied caused the men to drink surface water.

Few beer drinkers had typhoid or malarial fever in the Third Tennessee, and this I attribute to the fact that they drank little water. The water was, in my opinion, the prime cause of typhoid.

In the summing up of probable typhoid cases in the regiment I must disagree. I must reserve to myself the right to say positively that I can usually differentiate between typhoid and intermittent malarial fever, especially as the microscope was called into use in several instances. Any cases that I diagnosed as malarial intermittent fever were very positively malarial intermittent fever. The cases marked malarial remittent fever I am not so positive of, but some few of these were undoubtedly of a peculiar malarial type that I intended looking into this summer, but will not be able to do so. I found in a number of these cases a peculiar parasite differing, but not markedly, from the known plasmodia. In these very cases I found no sign of the typhoid bacillus, nor was there reaction with the culture. These cases ran an almost typical typhoid course, and one post-mortem that I saw in a case that was diagnosed typhoid showed no lesion of Peyer's patches. Of the individual cases I can tell you nothing positively.

I have been practicing in the South, 100 miles from Chickamauga, Ga., for ten years; have been teaching pathology and bacteriology for a number of years, and consider myself fairly competent as a diagnostician, and would beg to go on record as adhering to my first diagnosis in all cases, except malarial remittents, and believe my original diagnosis to have been right in the majority of them. The health of the regiment was never good at Chickamauga. The close contiguity of the regiment to the First Mississippi was unfortunate, but when the camp was moved to an open field, about August 12, there was immediate improvement, and from the date of arrival at Anniston, on September 6, the health of the regiment was almost ideal.

FIRST VERMONT VOLUNTEER INFANTRY.

Third Brigade, First Division, Third Army Corps.

In the May report Capt. James M. Hamilton states:

This regiment was mustered into the service of the United States between May 3 and May 16, 1898. It left Camp Olympia, near Burlington, Vt., the point of mobilization and muster, May 21, and arrived at Camp George H. Thomas, Chickamauga Park, Ga., May 24, 1898. The condition of the command has been remarkably good from a medical standpoint, considering change of mode of living and of climate. Since removal to Chickamauga the prevailing diseases have been bronchitis and diarrhea, neither of a severe type. The bowel trouble has been caused by indiscreet use of poor water and bad drinks sold by hucksters. The medical department has attempted to regulate this matter, and has met with fairly good success.

CONDENSED SICK REPORT FROM MAY 16 TO 31, INCLUSIVE.

Mean strength	1,026
Diarrhea	39
Dysentery	2

Indigestion	2
Intestinal colic	3
Other diseases	54
Total	100

In the June report Lieut. J. W. Jackson, acting surgeon, states:

We have a good many cases suffering from the effects of vaccination, but all are now improving. Typhoid fever is beginning to appear, and I fear that we may have a good many cases of this disease.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,004
Typhoid fever	5
Diarrhea	140
Dysentery	8
Intestinal dyspepsia	2
Indigestion	11
Intermittent malaria	5
Remittent malaria	4
Other diseases	113
Total	288

The July report is signed by Captain Hamilton without comment.

CONDENSED SICK REPORT FOR JULY.

Mean strength	901
Diarrhea	91
Typhoid fever	27
Intermittent malaria	54
Gastric indigestion	7
Dysentery	12
Gastritis	5
Enteritis	2
Remittent malaria	4
Intestinal indigestion	1
Other diseases	77
Total	280

During this month there are reported a number of cases of German measles, confined chiefly to two companies.

In the August report Major Hamilton makes the following statement:

This command consists of twelve companies and a detachment of hospital corps. August 19 it left Camp George H. Thomas, Chickamauga Park, Ga., and arrived at Fort Ethan Allen, Vt., August 21. August 17 Maj. H. H. Lee's resignation as surgeon was accepted, and Capt. James Hamilton was promoted to major and surgeon. This command has had much typhoid fever, caused undoubtedly by the insanitary condition of Camp Thomas. Since arriving at Fort Ethan Allen all stools have been disinfected and then buried. All mattresses and pillows used by typhoid patients have been disinfected, and all possible means have been adopted to prevent the spread of the infection.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength not given.	
Typhoid fever	66
Intermittent malaria	231
Remittent malaria	22
Diarrhea	128

Gastritis	4
Gastralgia	1
Intestinal indigestion	1
Dysentery	15
Enteritis	1
Gastric indigestion	15
Debility and diarrhea	1
Indigestion	5
Other diseases	155
Total	645

In the September report Major Hamilton states:

On September 4, in accordance with General Orders, No. 130, A. G. O., the entire regiment, save the necessary property guard and the medical department, was given thirty days' leave of absence and furlough. The prevailing sickness in the regiment has been typhoid fever acquired at Chickamauga Park, Ga.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength for four days	989
Typhoid fever	50
Intermittent malaria	102
Diarrhea	43
Remittent malaria	2
Gastritis	1
Dysentery	6
Gastric indigestion	2
Other diseases	36
Total	242

In the October report Major Hamilton states:

All the regiment except the medical department is absent from camp; many at their homes are coming down with typhoid fever. The last patient went from the hospital here October 19.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength not given.	
Rheumatism	1
Chancroid	1
Typhoid fever	11
Total	13

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

No. 1. Company G: Diarrhea and heat exhaustion, May 26 to June 22.

No. 2. Company G: Diarrhea, May 28 to June 12.

No. 3. Company A: Diarrhea, June 5 to 15.

No. 4. Company A: Diarrhea, June 7 to 19.

No. 5. Company M: Diarrhea, June 10; sent to division hospital June 21. There is no record of this man leaving the hospital. His name next occurs on sick report with diarrhea from August 3 to 14, and then with quotidian malaria from August 14 to 21.

No. 6. Company K: Malaria, June 10; sent to division hospital June 29. There is no record of this man leaving the hospital. He is reported with diarrhea August 8 to 18.

No. 7. G: Enteritis, June 16; sent to division hospital June 18; still sick in hospital August 23.

No. 8. Company D: Typhoid fever, June 26; died August 25.

No. 9. Company F: Typhoid fever, June 29; sent to Fort McPherson July 24.

No. 10. Company E: Typhoid fever, June 30 to August 6.

No. 11. Company F: Typhoid fever, June 30; sent to Fort McPherson July 24.

No. 12. Company D: Typhoid fever, July 1; furloughed from division hospital August 22.

No. 13. Staff: Typhoid fever, July 2; still sick July 31.

No. 14. Company F: Indigestion, July 6; sent to division hospital July 28. The time of leaving hospital is not given; however, the patient probably did not remain but a few days, as his name again occurs on sick report with malaria, from August 4 to 12.

No. 15. Company F: Diarrhea, July 6; still sick August 31.

No. 16. Company B: Diarrhea, July 6; sent to division hospital July 16. There is no further record of this case.

No. 17. Company D: Typhoid fever, July 7; died July 12.

No. 18. Company F: Malaria, July 8; sent to division hospital August 23. It seems that this man was returned to quarters July 29, but was not able to return to duty and was again sent to the hospital.

No. 19. Company K: Diarrhea, July 8; still sick July 31.

No. 20. Company not given: Diarrhea, July 8 to August 23.

No. 21. Company I: Typhoid fever, July 9 to August 16.

No. 22. Company M: Typhoid fever, July 10; sent to Fort McPherson July 24.

No. 23. Company F: Diarrhea, July 10; sent to hospital July 22. There is no further record of this case.

No. 24. Company F: Typhoid fever, July 11 to August 18.

No. 25. Company not given: Diarrhea, July 11 to August 13.

No. 26. Company L: Intermittent malaria, July 12 to August 1.

No. 27. Company not given: Diarrhea, July 12; sent to division hospital July 26. There is no further record of this case.

No. 28. Company L: Typhoid fever, July 12 to August 23.

No. 29. Company L: Intermittent malaria, July 13 to 23.

No. 30. Company L: Typhoid fever, July 13; sent to Fort McPherson July 24.

No. 31. Company F: Gastritis, July 14; sent to division hospital August 4. There is no further record of this case.

No. 32. Company H: Diarrhea, July 14 to 30.

No. 33. Company F: Intermittent malaria, July 14; still sick July 31.

No. 34. Company B: Malaria, July 14; died July 29.

No. 35. Company I: Gastritis, July 15; sent to division hospital July 30; returned to duty August 7.

No. 36. Company I: Diarrhea, July 15; still sick August 31.

No. 37. Company C: Typhoid fever, July 16; sent to Fort McPherson July 24.

No. 38. Company A: Remittent malaria, July 16; still sick in hospital July 31.

No. 39. Company A: Diarrhea, July 18; still sick in hospital July 31.

No. 40. Company F: Typhoid fever, July 18; sent to Fort McPherson July 24.

No. 41. Hospital steward: Indigestion, July 19 to August 23.

No. 42. Company B: Typhoid fever, July 19; died July 25.

No. 43. Company D: Intermittent malaria, July 20 to September 1.

No. 44. Company L: Diarrhea, July 20 to August 5.

No. 45. Company F: Typhoid fever, July 20 to August 23. This man is recorded as having had diarrhea June 15 and 16.

No. 46. Company L: Typhoid fever, July 20; furloughed August 12.

No. 47. Company B: Tertian malaria, July 20; sent to division hospital August 7. There is no further record of this case.

No. 48. Company E: Typhoid fever, July 20 to September 18.

No. 49. Company L: Intermittent malaria, July 21 to 31.

No. 50. Company C: Typhoid fever, July 21; sent to Fort McPherson July 24.

No. 51. Company L: Typhoid fever, July 21; sent to Fort McPherson July 24.

No. 52. Company F: Diarrhea, July 21; still sick in hospital July 31.

No. 53. Band: Diarrhea, July 21; still sick in hospital July 31.

No. 54. Company H: Typhoid fever, July 21; sent to Fort McPherson July 24.

No. 55. Company D: Malaria, July 22 to August 12.

- No. 56. Company E: Malaria, July 22; sent to Fort Ethan Allen August 18.
- No. 57. Company I: Intermittent malaria, July 22; still sick August 23.
- No. 58. Company D: Tertian malaria, July 22 to August 5.
- No. 59. Company D: Quotidian malaria, July 22; still sick September 2.
- No. 60. Company M: Remittent malaria, July 23; furloughed August 6.
- No. 61. Company A: Intermittent malaria, July 23 to August 21.
- No. 62. Company I: Remittent malaria, July 23; sent to Fort Ethan Allen August 24.
- No. 63. Company L: Diarrhea, July 24 to August 23.
- No. 64. Company M: Typhoid fever, July 24; disposition not given.
- No. 65. Company E: Typhoid fever, July 24 to August 23.
- No. 66. Company D: Remittent malaria, July 24 to August 24.
- No. 67. Company F: Typhoid fever, July 24 to August 23.
- No. 68. Company A: Diarrhea, July 24; furloughed August 23.
- No. 69. Company D: Quotidian malaria, July 24; furloughed August 8.
- No. 70. Company L: Diarrhea, July 24; furloughed August 9.
- No. 71. Company L: Diarrhea, July 24; furloughed August 23.
- No. 72. Company B: General debility, July 24 to August 25.
- No. 73. Company F: Typhoid fever, July 25; died August 10.
- No. 74. Company B: Typhoid fever, July 25; furloughed August 24. This man is reported with dysentery July 11 to 16.
- No. 75. Company H: Quotidian malaria, July 25; still sick August 21.
- No. 76. Company I: Quotidian malaria, July 25; furloughed August 9.
- No. 77. Staff: Typhoid fever, July 25; returned to duty August 21, and furloughed September 4.
- No. 78. Company I: Quotidian malaria, July 25; furloughed August 22.
- No. 79. Company A: Malaria, July 25; furloughed August 25.
- No. 80. Company not given: Quotidian malaria, July 25; furloughed August 22.
- No. 81. Company D: Quotidian malaria, July 25; furloughed August 7.
- No. 82. Company C: Quotidian malaria, July 26; furloughed August 10.
- No. 83. Company K: Intermittent malaria, July 26; furloughed August 5.
- No. 84. Company L: Gastritis, July 26; furloughed August 4.
- No. 85. Company K: Quotidian malaria, July 26; furloughed August 30.
- No. 86. Company G: Dysentery, July 26; furloughed August 10.
- No. 87. Company B: Intermittent malaria, July 26; furloughed August 5.
- No. 88. Staff: Typhoid fever, July 27; furloughed August 1.
- No. 89. Company K: Diarrhea, July 27; furloughed August 22.
- No. 90. Company B: Tertian malaria, July 27; furloughed August 11.
- No. 91. Company M: Dysentery, July 27 to August 21.
- No. 92. Company L: Quotidian malaria, July 28; sent to Fort Ethan Allen August 21.
- No. 93. Company F: Malaria, July 28; sent to Fort Ethan Allen August 21.
- No. 94. Company A: Intermittent malaria, July 28 to August 22.
- No. 95. Company M: Quotidian malaria, July 28 to August 21.
- No. 96. Company M: Intermittent malaria, July 29; sent to Fort Ethan Allen August 24.
- No. 97. Company I: Intermittent malaria July 29; died. Date of death not given.
- No. 98. Company B: Diarrhea, July 29; furloughed August 12.
- No. 99. Company A: Typhoid fever, July 30; sent to Fort Ethan Allen August 21.
- No. 100. Company L: Intermittent malaria, July 30; furloughed August 11.
- No. 101. Company B: Intermittent malaria, July 30; furloughed August 18.
- No. 102. Company H: Quotidian malaria, July 30; furloughed August 21.
- No. 103. Company B: Quotidian malaria, July 31; furloughed August 26.
- No. 104. Company F: Enteritis, July 31; furloughed August 24.
- No. 105. Company A: Diarrhea, August 1; furloughed September 4.
- No. 106. Company not given: Remittent malaria, August 1; furloughed August 28.
- No. 107. Company I: Quotidian malaria, August 1; furloughed August 18.
- No. 108. Company E: Typhoid fever, August 1 to 25.
- No. 109. Company not given: Dysentery, August 1 to 25.
- No. 110. Company L: Quotidian malaria, August 1; furloughed August 23.
- No. 111. Company K: Quotidian malaria, August 1; furloughed August 23.
- No. 112. Company F: Intermittent malaria, August 1; furloughed August 21.
- No. 113. Company not given: Quotidian malaria, August 1; furloughed August 23.
- No. 114. Company M: Gastric indigestion, August 2; furloughed August 13.
- No. 115. Company H: Diarrhea, August 2; furloughed August 18.
- No. 116. Company E: Typhoid fever, August 2; sent to Fort Ethan Allen August 24.
- No. 117. Company E: Typhoid fever, August 2 to September 13.
- No. 118. Company G: Remittent malaria, August 3; still sick August 31.
- No. 119. Company G: Diarrhea, August 3 to 23.
- No. 120. Company C: Quotidian malaria, August 3; furloughed August 21.
- No. 121. Company I: Malaria, August 3; furloughed August 22.
- No. 122. Company B: Diarrhea, August 3; furloughed September 4.
- No. 123. Company G: General debility, August 3; furloughed August 23.
- No. 124. Company B: Typhoid fever, August 3; sent to Fort Ethan Allen August 21.
- No. 125. Company B: Diarrhea, August 3; still sick August 31.
- No. 126. Company not given: Indigestion, August 3; still sick August 25.
- No. 127. Company I: Typhoid fever, August 3; died August 25.
- No. 128. Company F: Remittent malaria, August 3; still sick September 30.
- No. 129. Company I: Intermittent malaria, August 4 to 29.
- No. 130. Company K: Intermittent malaria, August 4; still sick August 31.
- No. 131. Company I: Quotidian malaria, August 4; furloughed August 23.
- No. 132. Company I: Quotidian malaria, August 4; furloughed August 18.
- No. 133. Company H: Quotidian malaria, August 4; furloughed August 18.
- No. 134. Company F: Remittent malaria, August 5 to 30.
- No. 135. Company L: Intermittent malaria, August 5 to 23.
- No. 136. Staff: Typhoid fever, August 5 to 24.
- No. 137. Company H: Diarrhea, August 5; furloughed August 18.
- No. 138. Company H: Quotidian malaria, August 5; furloughed August 25.
- No. 139. Company D: Diarrhea, August 5 to September 19. In hospital this case was diagnosed typhoid fever.
- No. 140. Company G: Intermittent malaria August 6 to 25.
- No. 141. Company I: Remittent malaria August 6; still sick September 3.

No. 142. Company E: Intermittent malaria, August 6; furloughed August 23.
No. 143. Company G: Intermittent malaria, August 6; furloughed August 24.
No. 144. Company I: Intermittent malaria, August 6; furloughed August 22.
No. 145. Company I: Quotidian malaria, August 6; furloughed August 22.
No. 146. Company D: Quotidian malaria, August 6; furloughed August 22.
No. 147. Company L: Remittent malaria, August 6; sent to Fort Ethan Allen August 21.
No. 148. Company C: Quotidian malaria, August 6; furloughed September 4.
No. 149. Company F: Typhoid fever, August 6; sent to Fort Ethan Allen August 21.
No. 150. Company L: Remittent malaria, August 6 to September 6.
No. 151. Company L: Typhoid fever, August 7; furloughed September 6.
No. 152. Company A: Quotidian malaria, August 7; furloughed August 24.
No. 153. Company G: Quotidian malaria, August 7; furloughed August 26.
No. 154. Company F: Diarrhea, August 7; furloughed August 21.
No. 155. Company not given: Quotidian malaria, August 7 to September 4.
No. 156. Staff: Typhoid fever, August 8; sent to division hospital August 10; further disposition not given.
No. 157. Company B: Diarrhea, August 8; furloughed August 19.
No. 158. Company K: Quotidian malaria, August 8; still sick August 31.
No. 159. Company I: Remittent malaria, August 8; furloughed August 22.
No. 160. Company K: Malaria, August 8 to September 13.
No. 161. Band: Typhoid fever, August 8 to September 19.
No. 162. Company F: Diarrhea, August 8; furloughed August 22.
No. 163. Company E: Typhoid fever, August 9; sick in Sternberg Hospital August 31.
No. 164. Company G: Intermittent malaria, August 9; furloughed August 23.
No. 165. Company K: Indigestion, August 9 to 29.
No. 166. Company A: Typhoid fever, August 9; sent to Ethan Allen Hospital August 21.
No. 167. Company M: Quotidian malaria, August 9; furloughed August 23.
No. 168. Company L: Malaria, August 9; furloughed August 22.
No. 169. Company F: Intermittent malaria, August 10; furloughed August 22.
No. 170. Company F: Typhoid fever, August 10; sent to Port Ethan Allen August 21.
No. 171. Company not given: Diarrhea, August 10; furloughed August 22.
No. 172. Company C: Quotidian malaria, August 10; furloughed August 23.
No. 173. Company H: Quotidian malaria, August 10; furloughed August 26.
No. 174. Company I: Typhoid fever, August 10; furloughed August 22.
No. 175. Company C: Intermittent malaria, August 11; still sick August 31.
No. 176. Company G: Intermittent malaria, August 11; furloughed August 23.
No. 177. Company F: Diarrhea, August 11; furloughed August 21.
No. 178. Company F: Intermittent malaria, August 11; furloughed August 22.
No. 179. Company E: Diarrhea, August 11; furloughed August 22.
No. 180. Company E: Diarrhea, August 11; furloughed August 22.

No. 181. Company B: Typhoid fever, August 11; furloughed August 23.
No. 182. Company H: Diarrhea, August 11; furloughed August 25. Elsewhere this man is reported with malaria, August 6 to 25.
No. 183. Company A: Diarrhea, August 12; furloughed August 25.
No. 184. Company I: Diarrhea, August 12; furloughed August 27.
No. 185. Company L: Intermittent malaria, August 12; still sick September 4.
No. 186. Company E: Intermittent malaria August 12; furloughed August 23.
No. 187. Company K: Quotidian malaria, August 12; furloughed August 26.
No. 188. Company L: Typhoid fever, August 12; furloughed August 18.
No. 189. Company K: Diarrhea, August 12; furloughed August 23.
No. 190. Company B: Remittent malaria, August 12; furloughed August 23.
No. 191. Company E: Typhoid fever, August 13; sent to Fort Ethan Allen August 18.
No. 192. Company D: Diarrhea, August 13; sent to Fort Ethan Allen August 21. At the latter place this case was recognized as one of typhoid fever.
No. 193. Company M: Typhoid fever, August 14; furloughed August 21.
No. 194. Company D: Quotidian malaria, August 14; furloughed August 25.
No. 195. Company A: Malaria, August 14; sent to Fort Ethan Allen August 21; returned to duty September 21.
No. 196. Company L: Typhoid fever, August 14 to September 29.
No. 197. Company H: Diarrhea, August 15; furloughed September 4.
No. 198. Company K: Intermittent malaria, August 15; furloughed August 24.
No. 199. Staff: Typhoid fever, August 15; furloughed September 4.
No. 200. Company D: Quotidian malaria, August 15; still sick September 30.
No. 201. Company H: Quotidian malaria, August 15; furloughed August 27.
No. 202. Company M: Malaria, August 15; sent to Fort Ethan Allen August 21; reported for duty September 20.
No. 203. Company B: Quotidian malaria, August 15; furloughed August 25.
No. 204. Company I: Quotidian malaria, August 15; furloughed August 25.
No. 205. Company F: Remittent malaria, August 15; furloughed September 2.
No. 206. Company not given: Quotidian malaria, August 16; furloughed August 26.
No. 207. Staff: Typhoid fever, August 16; sent to Ethan Allen Hospital August 21.
No. 208. Company D: Typhoid fever, August 16; sent to hospital August 21; reported for duty October 11. This man is reported as having had diarrhea August 4 and 5.
No. 209. Company A: Malaria, August 16 to September 23.
No. 210. Company not given: Malaria, August 16 to October 5.
No. 211. Company D: Quotidian malaria, August 16; furloughed September 4.
No. 212. Company F: Quotidian malaria, August 16; furloughed August 26.
No. 213. Company M: Intermittent malaria, August 17; furloughed September 4.
No. 214. Company L: Malaria, August 17 to September 16.
No. 215. Company D: Malaria, August 17; sent to Fort Ethan Allen August 21.
No. 216. Company M: Typhoid fever, August 18; sent to Ethan Allen Hospital August 21.
No. 217. Company I: Typhoid fever, August 18; sent to Fort Ethan Allen August 21; returned to duty October 11.

No. 218. Company not given: Quotidian malaria, August 18; furloughed September 4.

No. 219. Company I: Typhoid fever, August 18; sent to Fort Ethan Allen August 21; reported for duty September 27.

No. 220. Company M: Typhoid fever, August 18; sent to Fort Ethan Allen August 21; reported for duty September 26.

No. 221. Hospital corps: Typhoid fever, August 19 to October 16.

No. 222. Company not given: Quotidian malaria, August 19 to September 22.

No. 223. Company F: Quotidian malaria, August 20; furloughed September 3.

No. 224. Staff: Typhoid fever, August 21 to October 18.

No. 225. Company G: Quotidian malaria, August 22; still sick September 30.

No. 226. Company G: Quotidian malaria, August 22; furloughed September 2.

No. 227. Company D: Quotidian malaria, August 22; furloughed September 1.

No. 228. Company B: Typhoid fever, August 22; died October 18.

No. 229. Company H: Typhoid fever, August 22 to September 28.

No. 230. Company L: Typhoid fever, August 23; disposition not given.

No. 231. Company L: Typhoid fever, August 23; died September 16.

No. 232. Company C: Intermittent malaria, August 23; furloughed September 4.

No. 233. Company C: Typhoid fever, August 23 to September 19.

No. 234. Company C: Typhoid fever, August 23 to September 21.

No. 235. Company B: Malaria, August 23 to September 7.

No. 236. Company L: Typhoid fever, August 23; died September 17.

No. 237. Company C: Typhoid fever, August 24 to September 22.

No. 238. Company H: Intermittent malaria, August 24; furloughed September 4.

No. 239. Company K: Quotidian malaria, August 24; furloughed September 4.

No. 240. Company H: Quotidian malaria, August 24; furloughed September 4.

No. 241. Company not given: Typhoid fever, August 24 to September 22.

No. 242. Company H: Typhoid fever, August 24 to September 13.

No. 243. Company G: Malaria, August 24; furloughed September 2.

No. 244. Company A: Typhoid fever, August 25 to October 18.

No. 245. Company B: Malaria, August 25; furloughed September 5.

No. 246. Company K: Malaria, August 25; sent to hospital September 3. Further disposition not given.

No. 247. Company I: Typhoid fever, August 26; furloughed September 4.

No. 248. Company G: Typhoid fever, August 26 to September 30.

No. 249. Company not given: Typhoid fever, August 26; furloughed September 13.

No. 250. Company I: Typhoid fever, August 26; furloughed September 4.

No. 251. Company F: Typhoid fever, August 27; furloughed September 4.

No. 252. Company I: Diarrhea, August 27; furloughed September 4.

No. 253. Company not given: Typhoid fever, August 27; furloughed September 9.

No. 254. Company M: Typhoid fever, August 27; sent to Fort Ethan Allen August 30.

No. 255. Company A: Typhoid fever, August 27; sent to hospital August 30. Further disposition not given.

No. 256. Company I: Diarrhea, August 29; furloughed September 4.

No. 257. Staff: Typhoid fever, August 29 to September 29.

No. 258. Company not given: Quotidian malaria, August 29 to September 22.

No. 259. Company A: Diarrhea, August 30; furloughed September 4.

No. 260. Company C: Intermittent malaria, August 30; furloughed September 4.

No. 261. Company C: Intermittent malaria, August 30; furloughed September 4.

No. 262. Company C: Quotidian malaria, August 30; furloughed September 4.

No. 263. Company not given: Diarrhea, August 30; furloughed September 2.

No. 264. Company not given: Malaria, August 30 to September 28.

No. 265. Company C: Malaria, August 30; still sick September 30.

No. 266. Company F: Typhoid fever, August 30; disposition not given.

No. 267. Company F: Quotidian malaria, August 30; still sick September 30.

No. 268. Company F: Intermittent malaria, August 31; furloughed September 4.

No. 269. Company A: Diarrhea, August 31; furloughed September 4.

No. 270. Company B: Diarrhea, August 31; furloughed September 4.

No. 271. Company B: Quotidian malaria, August 31; furloughed September 4.

No. 272. Company K: Typhoid fever, August 31 to October 9.

No. 273. Hospital corps: Intermittent malaria, September 3; furloughed September 21.

No. 274. Company M: Quotidian malaria, September 3; furloughed September 21.

No. 275. Staff: Quotidian malaria, September 5; furloughed September 25.

No. 276. Company F: Typhoid fever, September 18; died October 6.

No. 277. Company L: Typhoid fever, September 26 to October 17.

No. 278. Company M: Typhoid fever, October 12; sent to Fort Ethan Allen October 18.

In the records of this regiment the word "duty" is found written where "furlough" is evidently intended. That this is the case is shown by the subsequent history of the patient and by the fact that the same record is made where cases are diagnosed typhoid fever.

SUMMARY.

Assembled at Camp Olympia, near Burlington, Vt., in April, 1898.

Mustered into United States service between May 3 and May 16, 1898.

Arrived at Chickamauga Park, Ga., May 24, 1898.

Strength on arrival, 1,026.

Date of first case of probable typhoid fever, May 26, 1898.

Date of first case of recognized typhoid fever June, 26, 1898.

Left Chickamauga Park, Ga., August 18, 1898.

Strength on departure, 996.

Number of cases of probable typhoid fever developed at Chickamauga 220

Arrived at Fort Ethan Allen, Vt., August 21, 1898.

Number of cases of probable typhoid fever developed after leaving Chickamauga Park, Ga. 58

Total number of cases of probable typhoid fever developed in the First Vermont Volunteer Infantry from May to September, 1898 278

These 278 cases were diagnosed as follows:

Typhoid fever 84

Malaria 132

Diarrhea.....	47
Indigestion.....	5
Gastritis.....	3
Dysentery.....	3
Enteritis.....	2
General debility.....	2
Total.....	278

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Barlow, George F.....	Pvt., F.	Sept. 16	Fort Ethan Allen, Vt.	Typhoid.
Bishop, Nelson E.....	Pvt., A.	Sept. 13	Oswell, Vt.....	Do.
Chalmers, John.....	Pvt., D.	Aug. 25	Fort Ethan Allen, Vt.	(Typhoid); malnutrition.
Curtin, Daniel F.....	2d lt.	Aug. 22	St. Vincent's Hospital, East Lake, Tenn.	Typhoid.
Dole, Arthur L.....	Pvt., F.	Aug. 9	Camp Thomas, Ga.....	Do.
Dunham, W. R.....	Pvt., E.	Sept. 5	Barre, Vt.....	(Typhoid); dysentery.
Fella, Frank.....	Pvt., C.	Aug. 2	Fort McPherson, Ga.....	Typhoid.
Flynn, James W.....	Pvt., M.	Sept. 17	Burlington, Vt.....	Do.
Foyles, Harold F.....	Pvt., A.	Sept. 6	Rutland, Vt.....	Do.
Hall, Emerson L.....	Artif., K.	Sept. 27	Hortonsville, Vt.....	(Typhoid); chronic diarrhea.
Hinman, F. L.....	Corpl., L.	Aug. 12	United States General Hospital, Fort McPherson, Ga.	Typhoid.
Lamson, Harry B.....	Corpl., E.	Aug. 14	Baltimore, Md.....	Spinal meningitis.
Leach, H.....	Pvt., B.	July 25	Chickamauga, Ga.....	Typhoid.
Marsette, W. F.....	Pvt., C.	July 18	.....	Acute peritonitis.
Place, C. A.....	Pvt., B.	July 29	Chickamauga, Ga.....	Typhoid.
Robillard, O. H.....	Pvt., C.	Oct. 5	Rutland, Vt.....	Do.
Shannon, R. F.....	Pvt., H.	Oct. 12	Montpelier, Vt.....	Do.
Smith, George R.....	Pvt., D.	July 12	Chickamauga, Ga.....	Do.
Smith, Harley A.....	Pvt., C.	Sept. 28	Pittsford, Vt.....	Do.
Smith, Henry.....	Pvt., L.	Sept. 17	Fort Ethan Allen, Vt.	Abscess resulting from typhoid.
Spafford, W. C.....	Mus., K.	June 1	Camp Thomas, Ga.....	Pneumonia.
Sullivan, W. H.....	Sgt., B.	Sept. 18	Fort Ethan Allen, Vt.	Typhoid.
Tupper, John L.....	Mus., F.	Oct. 6	.....do.....	Do.
Vollinger, J.....	Pvt., I.	Aug. 23	.....do.....	Do.
Wheelock, A. E.....	Pvt., D.	Oct. 6	St. Johnsbury, Vt.....	Do.
White, Fred E.....	Pvt., A.	Oct. 15	Ira, Vt.....	Cancer.

Total deaths.....	26
Deaths due to typhoid fever.....	22

Percentage of deaths among probable cases (278) of typhoid fever, 7.91.

Percentage of deaths among recognized cases (84) of typhoid fever, 26.19.

EIGHTH NEW YORK VOLUNTEER INFANTRY.

Third Brigade, First Division, Third Army Corps.

This regiment was mustered into the service of the United States between the 6th and 21st of May at Peekskill, N. Y. It left Peekskill May 23, and arrived at Chickamauga Park, Ga., May 25. At Chickamauga it was brigaded with the First Vermont and the Third Tennessee.

The first regimental sick report covers the period from May 26 to May 31, inclusive. In this report Major Neff, surgeon of the regiment, makes the following statement:

The prevailing diseases at Peekskill were tonsillitis and bronchitis; at Camp Thomas, diarrhea. The intestinal disturbances at Camp Thomas were due to change of climate, to differences in the character of the food, and to the high temperature to which the men were not accustomed.

CONDENSED SICK REPORT, MAY 26 TO 31, INCLUSIVE.

Mean strength.....	849.5
Intermittent malaria.....	4
Diarrhea.....	11

Gastro-enteritis.....	7
Dysentery.....	4
Other diseases.....	17
Total.....	43

Four of the cases of dysentery and three of diarrhea remained on the sick list at the expiration of the month.

In the June report Major Neff states:

The prevailing diseases are intestinal disturbances and malarial fever of the intermittent type. These are due to change of climate and diet. The camp has been thoroughly policed. An effort has been made to prevent men from using water from all surface springs. The command has been vaccinated during the month.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,099
Dysentery.....	5
Diarrhea.....	27
Intermittent malaria.....	22
Intestinal colic.....	6
Gastro-enteritis.....	12
Other diseases.....	43
Total.....	115

In the July report Major Neff states:

The prevailing diseases are intestinal disturbances and malarial fever of the intermittent type.

CONDENSED SICK REPORT FOR JULY.

The mean strength is recorded as 328. This must be a mistake, and in all probability it should be 1,328.

Diarrhea.....	142
Intermittent malaria.....	70
Remittent malaria.....	7
Dysentery.....	2
Typhoid fever.....	19
Gastro-enteritis.....	17
Flux.....	1
Other diseases.....	89
Total.....	347

In the August report Major Neff states:

The prevailing diseases are malarial fever of the intermittent type, intestinal colic, and typhoid. Causation: Insufficiency of tentage and impurity of water in connection with change of climate and diet. Measures of prevention: Thorough policing and filtering of all drinking water.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength.....	1,275
Typhoid fever.....	69
Diarrhea.....	518
Gastritis.....	7
Intermittent malaria.....	334
Remittent malaria.....	147
Intestinal colic.....	39
Dysentery.....	13
Pernicious malaria.....	4
Other diseases.....	7
Total.....	1,138

In the September report Major Neff repeats the same statement made in August.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,275
Inintermittent malaria	58
Remittent malaria	41
Malaria	21
Typhoid fever	164
Diarrhea	63
Intestinal colic	16
Dysentery	9
Other diseases	83
Total	455

This regiment left Chickamauga Park September 6, and was furloughed in New York September 9. Only 9 cases appear on the records as having been admitted to sick report after September 9.

In studying the sickness in this regiment we have made an alphabetical list of all names appearing on sick report, and from these have ascertained as far as possible the medical history of each case. Owing to the careless spelling of names, to the introduction or omission of initials, and to inaccuracies in statement of rank and company, this attempt to ascertain the number of total sick has proved to be not only a laborious task, but one whose results may not be absolutely correct. However, the figures arrived at are nearly exact. As we wish to make a critical study of sickness in this regiment, we will give a list of all individuals found on sick report. In doing this we will divide the sick into groups. The first group contains the cases of recognized typhoid fever, and is as follows:

No. 1. Typhoid fever, June 24; died July 1.

No. 2. Typhoid fever, July 4; sent to Leiter Hospital July 26; sent to Bellevue Hospital September 9.

No. 3. Typhoid fever, July 5; furloughed July 15. There is no further record of this case.

No. 4. Typhoid fever, July 5; sent to division hospital July 5; returned to duty August 1.

No. 5. Typhoid fever, July 10; sent to Fort McPherson July 24.

No. 6. Typhoid fever, July 10; sent to Fort McPherson July 24.

No. 7. Typhoid fever, July 11; sent to Fort McPherson July 24.

No. 8. Typhoid fever, July 14; sent to Leiter Hospital July 26; died July 31.

No. 9. Typhoid fever, July 15; sent to Leiter Hospital July 26; furloughed August 30.

No. 10. Typhoid fever, July 16; returned to duty August 5.

No. 11. Typhoid fever, July 16; sent to division hospital July 16; had endocarditis August 1.

No. 12. Typhoid fever, July 16; sent to Fort McPherson July 24. This man is reported to have suffered from heat exhaustion June 9 and 10.

No. 13. Typhoid fever, July 21; sent to division hospital July 21; furloughed August 3.

No. 14. Typhoid fever, July 23; sent to Fort McPherson July 24; returned to duty August 11.

No. 15. Typhoid fever, July 24; returned to duty August 21. This man is reported as having suffered from neuralgia July 22 and 23.

No. 16. Typhoid fever, July 21; sent to Leiter Hospital July 26; furloughed August 10. This man had the following previous illnesses: Diarrhea, June 11 to 13; intermittent malaria, July 20 and 21.

No. 17. Typhoid fever, July 29; sent to division hospital July 29; returned to duty August 21.

No. 18. Typhoid fever, July 30; furloughed August 11.

No. 19. Typhoid fever, July 31; died August 14.

No. 20. Typhoid fever, July 31; sick in Bellevue Hospital September 9.

No. 21. Typhoid fever, July 28; died August 18.

No. 22. Typhoid fever, July 28; returned to duty August 17.

No. 23. Typhoid fever, July 31; returned to duty August 14.

No. 24. Typhoid fever, July 31; returned to duty August 13. This man was probably furloughed August 13, instead of being returned to duty. Many regimental surgeons were in the habit of entering on the reports when men were furloughed "duty" or "furlough duty."

No. 25. Typhoid fever, August 2; died August 21.

No. 26. Typhoid fever, August 6; returned to quarters August 22.

No. 27. Typhoid fever, August 6; returned to duty August 31.

No. 28. Typhoid fever, August 10; returned to duty August 22.

No. 29. Typhoid fever, August 10; returned to duty August 22.

No. 30. Typhoid fever, August 22; sick leave August 31.

No. 31. Typhoid fever, August 26; died August 31. This man is recorded as having had diarrhea August 11 to 13.

No. 32. Typhoid fever, August 26; sick leave August 31.

No. 33. Typhoid fever, August 27; sick in Bellevue Hospital September 9.

No. 34. Typhoid fever, August 28; sick leave August 31. This man is registered as having had diarrhea August 1 and 2.

No. 35. Typhoid fever, August 10; returned to duty September 6.

No. 36. Typhoid fever, August 20; returned to duty September 6. This man had intermittent malaria August 8 to 13.

No. 37. Typhoid fever, August 20; sent to City Hospital, New York, September 9; returned to duty September 28. This man had intermittent malaria August 17 to 20.

No. 38. Typhoid fever, August 21; returned to duty September 16. This man had diarrhea August 12 to 14.

No. 39. Typhoid fever, August 18. There is no further record of this man.

No. 40. Typhoid fever, August 17; returned to duty September 24.

No. 41. Typhoid fever, August 17; died September 24.

No. 42. Typhoid fever, August 23; sick in Bellevue Hospital September 9. This man had neuralgia June 20 to 24.

No. 43. Typhoid fever, August 23; returned to duty September 18.

No. 44. Typhoid fever, August 23; sick in Bellevue Hospital September 9. This man had remittent malaria August 11 to 14.

No. 45. Typhoid fever, August 17; returned to duty September 24.

No. 46. Typhoid fever, August 25; sent to hospital September 9.

No. 47. Typhoid fever, August 25; returned to duty September 21.

No. 48. Typhoid fever, August 25; sent to Long Island Hospital September 9.

No. 49. Typhoid fever, August 26; sent to Sternberg Hospital August 30; furloughed October 18.

No. 50. Typhoid fever, August 26; sent to Sternberg Hospital August 30; furloughed October 4. This man is reported as having had intermittent malaria July 29, and the case is left incomplete.

No. 51. Typhoid fever, August 21; returned to duty September 18.

No. 52. Typhoid fever, August 26; returned to duty September 20.

No. 53. Typhoid fever, August 26; sent to St. Luke's Hospital September 9. This man had dysentery August 8 to 10.

No. 54. Typhoid fever, August 26; returned to duty September 30.

No. 55. Typhoid fever, August 27; returned to duty September 26.

This man is reported as having had gastro-enteritis June 2 to 26.

No. 56. Typhoid fever, August 27; sent to hospital September 9.

No. 57. Typhoid fever, August 27; sent to Long Island Hospital September 9.

No. 58. Typhoid fever, August 28; returned to duty September 18. This man is reported with intermittent malaria July 31, and the case is left incomplete.

No. 59. Typhoid fever, August 28; sent to Long Island Hospital September 9.

No. 60. Typhoid fever, August 28; returned to duty September 20.
 No. 61. Typhoid fever, August 28; returned to duty September 23.
 No. 62. Typhoid fever, August 28; returned to duty September 20.
 No. 63. Typhoid fever, August 29; sent to hospital September 9. This man is reported as having had diarrhea August 23 and 24 and diarrhea August 25 and 26.

No. 64. Typhoid fever, August 28; died September 14. This man had diarrhea July 26 to 28; diarrhea July 30 to August 2; diarrhea August 24 to 26.

No. 65. Typhoid fever, August 29; sent to Mount Vernon Hospital September 9.

No. 66. Typhoid fever, August 29; sent to Long Island Hospital September 13.

No. 67. Typhoid fever, August 30; sent to hospital September 9.

No. 68. Typhoid fever, August 31; sent to hospital September 9.

No. 69. Typhoid fever, August 31; returned to duty September 27.

No. 70. Typhoid fever, August 31; returned to duty September 25.

No. 71. Typhoid fever, August 31; no disposition given.

No. 72. Typhoid fever, August 10; sent to Presbyterian Hospital September 9. This man had dysentery August 8 to 10.

No. 73. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had intermittent malaria August 21 to 25 and intestinal colic August 30 to September 9. Evidently his typhoid fever should date from August 21.

No. 74. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had intermittent malaria August 22 to September 9.

No. 75. Typhoid fever, September 9; sent to St. Luke's Hospital September 9. This man had gastritis July 25 to August 6; intermittent malaria August 8 to 20; was granted sick leave August 29, and reported at St. Luke's Hospital September 9 with typhoid fever. Evidently in this case the initial date of the typhoid fever should be July 25.

No. 76. Typhoid fever, August 19; sent to Presbyterian Hospital September 9.

No. 77. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had intermittent malaria August 9 to 16; remittent malaria August 16 to 21, and was furloughed August 29. Evidently the initial date of this typhoid fever was August 9 instead of September 9.

No. 78. Typhoid fever, September 9; sent to St. Peter's Hospital September 9.

No. 79. Typhoid fever, September 9; sent to New York Hospital September 9. This man had diarrhea July 15 and 16; intermittent malaria August 8 to 18; was furloughed August 29, and appeared in the New York hospital September 9 with typhoid fever.

No. 80. Typhoid fever, September 9; sent to Bellevue Hospital. This man had diarrhea August 11 to 14 and intermittent malaria August 28 to September 9.

No. 81. Typhoid fever, September 9; sent to Mount Sinai Hospital September 9. This man had remittent malaria August 10 to 31.

No. 82. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had diarrhea August 19 to 22 and remittent malaria August 22 to 27, and was furloughed August 29.

No. 83. Typhoid fever, September 9; sent to Presbyterian Hospital September 9.

No. 84. Typhoid fever, September 9; sent to Presbyterian Hospital September 9.

No. 85. Typhoid fever, September 9; sent to Presbyterian Hospital September 9.

No. 86. Typhoid fever, August 6; sent to St. Luke's Hospital September 9. This man had intermittent malaria June 8 and 9; diarrhea, July 30 to August 6. Evidently in this case the initial date of the typhoid fever is July 30.

No. 87. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had intermittent malaria beginning August 21, and was granted sick leave August 29.

No. 88. Typhoid fever, September 9; sent to Long Island Hos-

pital September 9. This man had intermittent malaria August 26 to September 9.

No. 89. Typhoid fever, September 9; sent to St. Luke's Hospital September 9. This man had intermittent malaria August 24, and was furloughed August 29.

No. 90. Typhoid fever, September 9; sent to Presbyterian Hospital September 9.

No. 91. Typhoid fever, September 9; sent to St. Luke's Hospital September 9. This man had diarrhea August 18 and 19, and was furloughed August 29.

No. 92. Typhoid fever, August 28; sent to Harlem Hospital September 9. This man had diarrhea August 12 to 14.

No. 93. Typhoid fever, September 28; sent to German Hospital September 28.

No. 94. Typhoid fever, September 5; sent to St. Luke's Hospital September 9; died September 16. This man had gastroenteritis July 26 to 28.

No. 95. Typhoid fever, September 5; sent to St. Luke's Hospital September 9. This man had diarrhea August 17 to 19, diarrhea again August 22 and 23, and remittent malaria August 23 to 27. We suppose the initial date of the typhoid fever in this case to be August 17.

No. 96. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had remittent malaria August 6 to 31.

No. 97. Typhoid fever, September 9; sent to Long Island Hospital September 9; died September 14. This man had intermittent malaria September 1 to 9.

No. 98. Typhoid fever, September 9; sent to St. Luke's Hospital September 9; died September 17.

No. 99. Typhoid fever, September 9; sent to St. Luke's Hospital September 9.

No. 100. Typhoid fever, September 9; sent to St. Luke's Hospital September 9. This man had diarrhea, August 12 and 13, intermittent malaria August 8 to 21, and was granted sick leave August 29. Evidently the initial date of the typhoid fever in this case was August 8.

No. 101. Typhoid fever, September 9; sent to St. Peter's Hospital September 9. This man had diarrhea August 26 and 27 and intermittent malaria September 1 to 9.

No. 102. Typhoid fever, September 9; sent to Presbyterian Hospital September 9.

No. 103. Typhoid fever, September 9; sent to Presbyterian Hospital September 9.

No. 104. Typhoid fever, September 9; sent to St. Luke's Hospital September 9.

No. 105. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had intermittent malaria August 24 to 27.

No. 106. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had diarrhea August 14 to 16.

No. 107. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had diarrhea August 1 and 2, again August 12 to 22, and remittent malaria August 22 to 25.

No. 108. Typhoid fever, September 9; sent to German Hospital September 9.

No. 109. Typhoid fever, September 9; sent to New York Hospital September 9. This man was sick July 30 to August 30 with gastritis.

No. 110. Typhoid fever, September 9; sent to German Hospital September 9; died September 19.

No. 111. Typhoid fever, September 9; sent to German Hospital September 9. This man had intermittent malaria August 24 to 29 and diarrhea September 6 to 8.

No. 112. Typhoid fever, September 17; no disposition.

No. 113. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had intestinal colic June 2 to 4.

No. 114. Typhoid fever, September 9; sent to St. Luke's Hospital September 9; duty September 14. This man had intestinal colic August 10 to 13.

No. 115. Typhoid fever, September 9; sent to Flower Hospital September 9.

No. 116. Typhoid fever, September 9; sent to Fordham Hospital September 9. This man had diarrhea August 29 and 30.

No. 117. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had diarrhea August 31 to September 9.

No. 118. Typhoid fever, September 9; sent to Presbyterian Hospital September 9.

No. 119. Typhoid fever, September 9; sent to Presbyterian Hospital September 9.

No. 120. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had intermittent malaria from August 6 to August 28, when he was granted sick leave.

No. 121. Typhoid fever, September 9; sent to New York Hospital September 9.

No. 122. Typhoid fever, September 9; sent to Mount Sinai Hospital September 9; returned to duty September 28. This man had diarrhea July 10 and 11, diarrhea August 15 to 18, remittent malaria August 18 to 22.

No. 123. Typhoid fever, September 9; sent to New York Hospital September 9. This man had remittent malaria August 21, and was granted sick leave August 27.

No. 124. Typhoid fever, September 9; sent to St. Luke's Hospital September 9. This man had bronchitis July 31 to August 1.

No. 125. Typhoid fever, September 9; no disposition given.

No. 126. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had gastritis June 6 to 8, diarrhea August 26 and 27, diarrhea August 31 to September 9.

No. 127. Typhoid fever, September 9; sent to St. Luke's Hospital September 9; returned to duty September 15. This man had intermittent malaria August 23, and was granted sick leave August 29; he is also reported as having had diarrhea September 1 to 3.

No. 128. Typhoid fever, September 9; sent to Bellevue Hospital September 9; returned to duty September 10. This man had diarrhea August 4 to 10 and remittent malaria August 10 without any disposition.

No. 129. Typhoid fever, September 9; sent to Long Island Hospital September 9; returned to duty September 24. This man had remittent malaria September 6 to 9.

No. 130. Typhoid fever, September 9; sent to St. Francis' Hospital September 9.

No. 131. Typhoid fever, September 9; sent to St. Luke's Hospital September 9. This man had diarrhea August 31 to September 4.

No. 132. Typhoid fever, September 9; sent to St. Luke's Hospital September 9.

No. 133. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had intermittent malaria August 10 to 15, diarrhea August 19 to 21, remittent malaria August 21, and is next reported with typhoid fever September 9.

No. 134. Typhoid fever, September 9; sent to Harlem Hospital September 9.

No. 135. Typhoid fever, September 9; sent to St. Peter's Hospital September 9.

No. 136. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had gastro-enteritis June 28 to July 1; diarrhea August 20 and 21. We have supposed that the initial date of his typhoid fever was August 20.

No. 137. Typhoid fever, September 9; sent to Bellevue Hospital September 9; This man had diarrhea September 3 to 6; remittent malaria September 6 to 9.

No. 138. Typhoid fever, September 9; sent to Long Island Hospital September 9. This man had diarrhea August 27 and 28 and intermittent malaria August 31 to September 15. It is clear that this case was first diagnosed as diarrhea and the diagnosis was changed to intermittent malaria, but was not recorded as such until the man had been in the hospital six days with typhoid fever.

No. 139. Typhoid fever, September 9; sent to Long Island Hospital September 9.

No. 140. Typhoid fever, September 1; sent to Bellevue Hospital without date.

No. 141. Typhoid fever, September without date; sent to Presbyterian Hospital without date; returned to duty September 23. This man had intermittent malaria August 24 to 29.

No. 142. Typhoid fever, September 9; sent to Presbyterian Hospital September 9; returned to duty September 20. This man had diarrhea July 30 to August 5; intermittent malaria August 17 to 22; remittent malaria August 22; was granted sick leave August 27.

No. 143. Typhoid fever, September 9; sent to German Hospital September 9; returned to duty September 17.

No. 144. Typhoid fever, September 9; sent to Hudson Hospital September 9; returned to duty September 20. This man had diarrhea August 16 to 21.

No. 145. Typhoid fever, September 9; sent to Bellevue Hospital September 9; returned to duty September 14.

No. 146. Typhoid fever, September 9; no disposition given. This man had diarrhea August 27 and 28; diarrhea August 29 and 30, and remittent malaria September 1 to 9.

No. 147. Typhoid fever, September 9; sent to Mount Sinai Hospital September 9; returned to duty September 24. This man had intermittent malaria July 18 to 21; intermittent malaria July 29 to August 3; diarrhea August 10 to 12.

No. 148. Typhoid fever, September 9; sent to St. Luke's Hospital September 9; returned to duty September 14. This man had intermittent malaria August 13 to 18; remittent malaria August 18, and was granted sick leave August 31.

No. 149. Typhoid fever, September 9; sent to St. Luke's Hospital September 9; returned to duty September 14. This man had intermittent malaria August 13 to 18; remittent malaria August 18 to 23.

No. 150. Typhoid fever, September 9; sent to Presbyterian Hospital September 9. This man had dysentery May 31 and June 1. Evidently in this case the dysentery had nothing to do with the subsequent typhoid fever.

No. 151. Typhoid fever, September 9; sent to Long Island Hospital September 9. This man had diarrhea September 6 to 9.

No. 152. Typhoid fever, September 9; sent to St. Luke's Hospital September 9; returned to duty September 14. This man had remittent malaria July 10 and 11.

No. 153. Typhoid fever, September 9; sent to Mount Sinai Hospital September 9; returned to duty September 16. This man had diarrhea July 10 and 11; diarrhea July 30 to August 4; intermittent malaria August 23 and 24, and was granted sick leave August 29.

No. 154. Typhoid fever September 9; sent to Long Island Hospital September 9; returned to duty September 16. This man had diarrhea August 30 to September 9.

No. 155. Typhoid fever, September 9; sent to St. Luke's Hospital September 9; returned to duty September 14. This man had diarrhea August 20 to 22, and remittent malaria August 22 to 27.

No. 156. Typhoid fever, September 9; sent to Mount Sinai Hospital September 9.

No. 157. Typhoid fever, September 9; sent to German Hospital September 9.

No. 158. Typhoid fever, September 9; sent to Metropolitan Hospital September 9. This man had diarrhea July 14 to 21; diarrhea August 2 to 6; remittent malaria August 6, and was granted sick leave August 27. The initial date of this typhoid fever was probably August 2.

No. 159. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had remittent malaria July 31 to August 31.

No. 160. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had intermittent malaria August 29 to September 9.

No. 161. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had intermittent malaria August 6 to 13; intermittent malaria August 25; was granted sick leave August 29.

No. 162. Typhoid fever, September 9; sent to New York Hospital September 9; returned to duty September 21. This man had

diarrhea July 17 to 19; diarrhea July 26 to 29; intermittent malaria July 29 to August 27.

No. 163. Typhoid fever, September 9; sent to Long Island Hospital September 9; returned to duty September 21. This man had diarrhea July 11 to 14; diarrhea July 16 to 24.

No. 164. Typhoid fever, September 9; sent to Mount Sinai Hospital September 9.

No. 165. Typhoid fever, September 9; sent to Mount Sinai Hospital September 9. This man had diarrhea July 11 and 12; diarrhea July 31 to August 4.

No. 166. Typhoid fever, September 9; sent to German Hospital September 9.

No. 167. Typhoid fever, September 9; sent to Bellevue Hospital September 9.

No. 168. Typhoid fever, September 9; sent to Bellevue Hospital September 9. This man had remittent malaria September 6 to 9.

No. 169. Typhoid fever, September 9; sent to German Hospital September 9. This man had diarrhea August 15 to 17.

No. 170. Typhoid fever, August 15; sent to Sternberg Hospital August 15; furloughed October 15.

No. 171. Typhoid fever, July 11; sent to division hospital July 11; sent to Fort McPherson, without date.

No. 172. Typhoid fever, August 16; sent to division hospital August 16; sent to Sternberg Hospital August 30.

No. 173. Remittent malaria, July 31; sent to Sternberg Hospital August 30. Here the disease was diagnosed typhoid fever, and the patient died September 5.

No. 174. Intermittent malaria, August 11; sent to division hospital August 11. Here the disease was diagnosed typhoid fever, and the patient remained on sick report August 31.

No. 175. Intermittent malaria, August 4; patient was sent to division hospital without date. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 6.

No. 176. Intermittent malaria, July 28; sent to Leiter Hospital August 2. Here the disease was diagnosed typhoid fever; the patient was sent to Bellevue Hospital September 9, and was returned to duty September 20.

No. 177. Remittent malaria, August 2; patient was sent to division hospital without date. Here the disease was diagnosed typhoid fever, and the man was furloughed September 6.

No. 178. Remittent malaria, August 17; sent to division hospital without date. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 5.

No. 179. Remittent malaria, August 18; sent to division hospital without date. Here the disease was diagnosed typhoid fever, and the man was furloughed September 5.

No. 180. Typhoid fever, September 5; sent to Sternberg Hospital September 5; died September 12.

No. 181. Remittent malaria, August 6; sent to division hospital without date. Here the disease was diagnosed typhoid fever, and the patient was returned to duty September 21.

No. 182. Typhoid fever, August 18; patient sent to Sternberg Hospital August 18; furloughed September 5.

No. 183. Intermittent malaria, July 26; sent to Sternberg Hospital August 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 6.

No. 184. Remittent malaria, August 15; sent to division hospital without date. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 25.

No. 185. Typhoid fever, without date; sent to Sternberg Hospital August 30. Here the disease was diagnosed typhoid fever, and the disposition of the patient is not given.

No. 186. Remittent malaria, August 1; sent to Bellevue Hospital September 9. Here the disease was diagnosed typhoid fever.

No. 187. Typhoid fever, July 18; disposition not given.

No. 188. Typhoid fever, September 9; sent to Long Island Hospital September 12.

No. 189. Typhoid fever, July 16 to August 5.

No. 190. Typhoid fever, July 22; disposition not given.

It must not be supposed that September 9 was the initial date of many of these cases of typhoid fever. Inspection of the above figures will show that typhoid fever was not recognized in many cases until the patients reached the New York hospitals, and many of them were convalescent at the time of their admission to these hospitals.

The following is a list of the probable cases of typhoid fever which were not diagnosed as such either in the regiment or in hospital:

No. 1. Remittent malaria, July 29; furloughed August 27.

No. 2. Remittent malaria, July 23; furloughed August 5.

No. 3. Intermittent malaria, July 30; returned to duty August 26.

No. 4. Diarrhea, August 1; returned to duty August 19.

No. 5. Remittent malaria, August 3; furloughed August 29.

No. 6. Remittent malaria, August 10; furloughed August 22.

No. 7. Intermittent malaria, August 12; furloughed August 31.

No. 8. Intermittent malaria, August 15; furloughed August 29.

No. 9. Intermittent malaria, August 16; furloughed August 27.

No. 10. Remittent malaria, August 16; furloughed August 31.

No. 11. Intermittent malaria, August 17; furloughed August 29.

No. 12. Intermittent malaria, August 20; sick September 10.

This man had diarrhea July 15 to 23.

No. 13. Intermittent malaria, August 21; furloughed August 29.

No. 14. Remittent malaria, August 21; furloughed August 29.

This man had diarrhea August 20.

No. 15. Intermittent malaria, August 22; furloughed August 29.

No. 16. Intermittent malaria, August 21; furloughed August 29.

This man had intermittent malaria, July 31, and the record is left incomplete.

No. 17. Intermittent malaria, August 23; furloughed August 29.

No. 18. Diarrhea, August 25; returned to duty September 16.

No. 19. Intermittent malaria, August 29; returned to duty September 23.

No. 20. Intermittent malaria, August 29; returned to duty September 16. This man had intermittent malaria July 4 to 6.

No. 21. Diarrhea, August 31; returned to duty September 23.

No. 22. Diarrhea, June 18; still sick July 31; no report after this date. This man had diarrhea May 26 and 27.

No. 23. Intermittent malaria, without date; sent to division hospital July 13; returned to duty August 5.

No. 24. Remittent malaria, without date; sent to division hospital August 19; furloughed August 26.

No. 25. Remittent malaria, without date; sent to division hospital August 20; furloughed August 30.

No. 26. Intermittent malaria, August 18; furloughed August 29.

No. 27. Intermittent malaria, August 18; furloughed August 29.

No. 28. Intermittent malaria, August 20; furloughed August 29.

No. 29. Intermittent malaria, August 20; furloughed August 29.

No. 30. Intermittent malaria, August 8; furloughed August 29.

No. 31. Diarrhea, July 28; returned to duty August 22.

No. 32. Intermittent malaria, July 30; furloughed August 29.

No. 33. Diarrhea, July 30; returned to duty August 14. This man had diarrhea July 15 and 16; dysentery July 22 to 27.

No. 34. Remittent malaria, August 1; furloughed August 29.

No. 35. Intermittent malaria, August 6; furloughed August 29.

No. 36. Intermittent malaria, August 9; furloughed August 29.

No. 37. Intermittent malaria, August 11; furloughed August 29.

No. 38. Intermittent malaria, August 12; furloughed August 29.

No. 39. Intermittent malaria, August 12; returned to duty September 21.

No. 40. Intermittent malaria, August 23; returned to duty September 16.

No. 41. Intermittent malaria, August 29; returned to duty September 16.

No. 42. Intermittent malaria, August 29; returned to duty September 17.

- No. 43. Diarrhea, August 29; returned to duty September 21.
 No. 44. Diarrhea, August 29; returned to duty September 15.
 No. 45. Intermittent malaria, July 30; furloughed August 29.
 No. 46. Diarrhea, July 16 to 18; diarrhea, July 30 to August 2; intermittent malaria, August 4 to 16; remittent malaria, August 16; granted sick leave August 31.
 No. 47. Intermittent malaria, July 31 to August 5; remittent malaria, August 5; granted sick leave August 31.
 No. 48. Intermittent malaria, July 31 to August 13; diarrhea, August 14; still sick August 31.
 No. 49. Diarrhea, July 18 and 19; diarrhea, August 3 to 8; intermittent malaria, August 9; granted sick leave August 27.
 No. 50. Diarrhea, August 12 to 18; remittent malaria, August 18; furloughed August 22.
 No. 51. Intermittent malaria, August 15 to 31.
 No. 52. Intermittent malaria, August 17; furloughed August 31.
 No. 53. Diarrhea, June 7 to 14; intermittent malaria, June 15 to 19; intermittent malaria, June 24 to 29; intermittent malaria, July 1 to 4.
 No. 54. Intermittent malaria, September 4 to 14.
 No. 55. Intermittent malaria, August 4 to 10; remittent malaria, August 10; furloughed August 27.
 No. 56. Intermittent malaria, August 4 to 11; diarrhea, August 16 to 27; malaria, August 27 to September 15.
 No. 57. Intermittent malaria, July 13 to 17; diarrhea, July 18 to 22; intermittent fever, August 9 to 14; diarrhea, August 19; granted sick leave August 29.
 No. 58. Diarrhea, August 14 to 16; remittent malaria, August 16; granted sick leave August 31; sent to Harlem Hospital with malaria September 9.
 No. 59. Intermittent malaria, June 11 to 22.
 No. 60. Intermittent malaria, June 29 to July 6; gastritis, July 14 to August 2.
 No. 61. Diarrhea, August 1 and 2; remittent malaria, August 12 to 22; diarrhea, August 22 to 25.
 No. 62. Diarrhea, August 5 to 8; diarrhea, August 9 to 11; diarrhea, August 11 to September 6.
 No. 63. Diarrhea, July 24 to 26; intermittent malaria, August 6 to 10; remittent malaria, August 10; granted sick leave August 27.
 No. 64. Intermittent malaria, August 9 to 13; remittent malaria, August 13; granted sick leave August 29.
 No. 65. Diarrhea, August 16 to 19; intermittent malaria, August 24; granted sick leave August 29.
 No. 66. Intermittent malaria, August 18; granted sick leave August 29.
 No. 67. Remittent malaria, without date; sent to division hospital August 13; granted sick leave August 22.
 No. 68. Remittent malaria, without date; sent to division hospital August 16; furloughed August 24.
 No. 69. Remittent malaria, without date; sent to division hospital August 21; furloughed August 27.
 No. 70. Diarrhea, July 29 to August 12; remittent malaria, August 13; granted sick leave August 31.
 No. 71. Diarrhea, July 30 to August 15; diarrhea, August 16 and 17.
 No. 72. Intermittent malaria, August 9 to 14; remittent malaria, August 14 to 27.
 No. 73. Intermittent malaria, August 17; granted sick leave August 29.
 No. 74. Diarrhea, August 26 to 28; intermittent malaria, August 31 to September 17.
 No. 75. Intermittent malaria, August 29 to September 16.
 No. 76. Intermittent malaria, August 29 to September 15.
 No. 77. Remittent malaria, without date; sent to division hospital August 16; granted sick leave August 30.
 No. 78. Intermittent malaria, July 31 to August 28.
 No. 79. Diarrhea, July 31 to August 6; remittent malaria, August 6 to 14.
 No. 80. Intermittent malaria, August 9 to 27; diarrhea, August 29 and 30.
 No. 81. Intermittent malaria, August 9 to 14; remittent malaria, August 14; granted sick leave August 29.
 No. 82. Intermittent malaria, August 13 to 26.
 No. 83. Diarrhea, August 16 and 17; intermittent malaria, August 19; granted sick leave August 29.
 No. 84. Remittent malaria, August 16; granted sick leave August 31.
 No. 85. Diarrhea, August 17 to 19; remittent malaria, August 19; sent to Bellevue Hospital September 8.
 No. 86. Intermittent malaria, August 18; granted sick leave August 29.
 No. 87. Diarrhea, August 18 and 19; diarrhea, August 24 and 25; diarrhea, August 29 and 30.
 No. 88. Diarrhea, May 26 to 28; intermittent malaria, August 21 to 28; intermittent malaria, August 29 to September 15.
 No. 89. Intermittent malaria, August 3 to 13; intermittent malaria, August 13; granted sick leave August 29.
 No. 90. Diarrhea, August 29 to September 12.
 No. 91. Intermittent malaria, August 30 to September 14.
 No. 92. Continued malaria, without date; sent to Sternberg Hospital, September 5; furloughed September 23.
 No. 93. Remittent malaria, without date; sent to division hospital August 16; furloughed August 23.
 No. 94. Gastritis, July 29 to August 2; remittent malaria, August 4 to 6; remittent malaria, August 6 to 19.
 No. 95. Diarrhea, August 2 to 6; remittent malaria, August 6 to 19.
 No. 96. Intermittent malaria, August 11 to 16; remittent malaria, August 16 to 22.
 No. 97. Intermittent malaria, August 14; still sick August 31. There is no further record of this man.
 No. 98. Intermittent malaria, August 22 to 28; intermittent malaria, August 29 to September 15.
 No. 99. Intermittent malaria, August 29 to September 17.
 No. 100. Diarrhea, August 19; sent to division hospital August 20. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 27.
 No. 101. Diarrhea, August 20 and 21; remittent malaria, August 21; granted sick leave August 27.
 No. 102. Diarrhea, August 20 and 21; intermittent malaria August 22; granted sick leave August 29.
 No. 103. Diarrhea, August 23 to 25; intermittent malaria, August 29 to September 20.
 No. 104. Diarrhea, August 29 to September 12.
 No. 105. Intermittent malaria, August 29 to September 10.
 No. 106. Intermittent malaria, August 31 to September 15.
 No. 107. Diarrhea, July 14 and 15; diarrhea, July 30 to August 4; intermittent malaria, August 6 to 17; intermittent malaria, August 21; granted sick leave August 29.
 No. 108. Intermittent malaria, July 31 to August 6; remittent malaria, August 6; granted sick leave August 29.
 No. 109. Diarrhea, August 11 to 14; remittent malaria August 16; granted sick leave August 31.
 No. 110. Remittent malaria, August 11; granted sick leave August 27.
 No. 111. Diarrhea, August 15 to 19; intermittent malaria, August 22; granted sick leave August 29.
 No. 112. Diarrhea, August 14 to 16; sent to division hospital August 16. Here the diagnosis was changed to remittent malaria. The patient was returned to duty August 26.
 No. 113. Diarrhea, July 21 to 25; diarrhea, July 30 to August 8; intermittent malaria, August 17; granted sick leave August 29.
 No. 114. Diarrhea, June 1 to 3; intermittent malaria, July 31 to August 22.
 No. 115. Remittent malaria, August 16 to September 19.
 No. 116. Diarrhea, August 7 to 10; remittent malaria, August 10; granted sick leave August 31.

No. 117. Intermittent malaria, August 9 to 13; diarrhea, August 19 to 21; remittent malaria, August 21; granted sick leave August 27.

No. 118. Diarrhea, August 9 and 10; diarrhea, August 16 to 19; intermittent malaria, August 22; granted sick leave August 29.

No. 119. Intermittent malaria, August 9 to 17; intermittent malaria, August 21; granted sick leave August 29.

No. 120. Remittent malaria, August 14; granted sick leave August 31; reported still sick in New York September 16.

No. 121. Intermittent malaria, August 30 to September 17.

No. 122. Remittent malaria, September 3 to 14.

No. 123. Diarrhea, August 5 and 6; sent to division hospital August 6. Here the diagnosis was changed to malaria. Returned to duty August 22.

No. 124. Intermittent malaria, August 10 to 16; remittent malaria, August 16 to 22; sent to Harlem Hospital with malaria September 9.

No. 125. Intermittent malaria, August 13 to 18; remittent malaria, August 21; granted sick leave August 27.

No. 126. Remittent malaria, August 14 to 27.

No. 127. Remittent malaria, August 16; granted sick leave August 31.

No. 128. Remittent malaria, August 29 and 30; remittent malaria, September 4 to 15.

No. 129. Intermittent malaria, August 25 to September 16.

No. 130. Intermittent malaria, August 27 to September 19.

No. 131. Intermittent malaria, July 31 to August 13. This man had constipation from July 27 to 31.

No. 132. Diarrhea, July 31 to August 10; intermittent malaria, August 10 to 22.

No. 133. Intermittent malaria, August 3 to 11; remittent malaria, August 11; granted sick leave August 29.

No. 134. Intermittent malaria, August 5 to 10; remittent malaria, August 10 to 28.

No. 135. Intermittent malaria, August 6 to 31; remittent malaria, September 9 to 12.

No. 136. Intermittent malaria, August 6 to 21.

No. 137. Diarrhea, August 7 to 10; remittent malaria, August 10 to 22.

No. 138. Diarrhea, August 7 to 10; remittent malaria, August 10 to 22.

No. 139. Intermittent malaria, August 10 to 22; remittent malaria, August 22 to 27.

No. 140. Intermittent malaria, August 8; granted sick leave August 29.

No. 141. Intermittent malaria, August 8 to 13; remittent malaria, August 13 to 23.

No. 142. Malaria, July 13 to 30.

No. 143. Diarrhea, July 26 to August 1; intermittent malaria, August 3 to 7; intermittent malaria, August 10 to 22; sent to Sternberg Hospital August 31.

No. 144. Intermittent malaria, August 14 to 19; remittent malaria, August 19; granted sick leave August 27.

No. 145. Intermittent malaria, August 1 to 16.

No. 146. Intestinal colic, August 18 and 19; intermittent malaria, August 20; granted sick leave August 29.

No. 147. Diarrhea, August 25 and 26; intermittent malaria, August 29 to September 18.

No. 148. Intermittent malaria, July 16 to 26.

No. 149. Intermittent malaria, June 21 to 25; intermittent malaria, June 29 to July 3; diarrhea, July 3 to August 13; remittent malaria, August 14 to 17.

No. 150. Intermittent malaria, July 31; died (no date given).

No. 151. Diarrhea, August 29 to September 9; malaria, September 9; sent to St. Luke's Hospital September 28.

No. 152. Diarrhea, July 22 to 24; intermittent malaria, August 17; granted sick leave August 29.

No. 153. Intermittent malaria, August 29 to September 15.

No. 154. Remittent malaria, August 5 to 16.

No. 155. Intermittent malaria, August 6 to 10; remittent malaria, August 10 to 16.

No. 156. Intermittent malaria, August 7 to 25; diarrhea, September 1 to 3.

No. 157. Diarrhea, August 9 to 13; remittent malaria, August 13; granted sick leave August 27.

No. 158. Intermittent malaria, August 28 to September 15.

No. 159. Intermittent malaria, August 22 to 28; remittent malaria, August 29 to September 14.

No. 160. Intermittent malaria, August 31 to September 20.

No. 161. Intermittent malaria, July 15 to August 21.

No. 162. Diarrhea, July 12 to 24; intermittent malaria, July 30 to August 13.

No. 163. Diarrhea, July 30 to August 5; diarrhea, August 7 to 12.

No. 164. Diarrhea, May 21 to 23; intermittent malaria, July 8 to 22; intermittent malaria, July 31; died August 23.

No. 165. Diarrhea, July 15 and 16; gastro-enteritis, July 25 to 27; diarrhea, August 5 and 6; diarrhea, August 10 to 14; remittent malaria, August 14; granted sick leave August 31.

No. 166. Diarrhea, August 5 and 6; remittent malaria, August 6; granted sick leave August 28.

No. 167. Diarrhea, August 9 and 10; diarrhea, August 16 to 19; remittent malaria, August 19 to 21.

No. 168. Remittent malaria, August 10 to 22.

No. 169. Remittent malaria, August 14; granted sick leave August 29.

No. 170. Intermittent malaria, June 26 to 28; remittent malaria, August 6 to 14; remittent malaria, August 16; granted sick leave August 27.

No. 171. Intermittent malaria, August 29 to September 20.

No. 172. Intermittent malaria, August 30 to September 17.

No. 173. Intermittent malaria, August 31 to September 25.

No. 174. Diarrhea, July 11 to 24.

No. 175. Diarrhea, July 12 to 24.

No. 176. Intermittent malaria, August 25 to September 20.

No. 177. Intermittent malaria, July 13 to 27.

No. 178. Intermittent malaria, August 8; granted sick leave August 29.

No. 179. Diarrhea, August 10 and 11; remittent malaria, August 13; granted sick leave August 31.

No. 180. Diarrhea, August 29 to September 24.

No. 181. Diarrhea, August 4 to 15; diarrhea, August 16 to 19; remittent malaria, August 20; granted sick leave August 29.

No. 182. Diarrhea, August 5 and 6; remittent malaria, August 6 to 23.

No. 183. Diarrhea, August 5 and 6; remittent malaria, August 6 to 27.

No. 184. Diarrhea, August 18 and 19; intermittent malaria, September 3 to 18.

No. 185. Diarrhea, August 4 to 6; remittent malaria, August 6; granted sick leave August 29; died September 26.

No. 186. Remittent malaria, August 8; granted sick leave August 29.

No. 187. Remittent malaria, August 14; granted sick leave August 29.

We will now proceed to give a complete list of all individuals found on the sick reports of this regiment not already given in the above lists. These are as follows:

No. 1. Intestinal colic, June 1 to 5.

No. 2. Gastro-enteritis, June 5 to 7.

No. 3. Cystitis, June 18 to 27.

No. 4. Diarrhea, July 12 to 14.

No. 5. Diarrhea, July 14 and 15; diarrhea, July 16 to 23.

No. 6. Intermittent malaria, July 15 and 16.

No. 7. Diarrhea, July 20 to 28.

No. 8. Constipation, July 28 and 29; diarrhea, July 30; incomplete.

- No. 9. Diarrhea, July 12; incomplete.
- No. 10. Intermittent malaria, July 23; incomplete.
- No. 11. Diarrhea, June 1 and 2.
- No. 12. Dysentery, June 2 to 5.
- No. 13. Gastro-enteritis, June 11 and 12.
- No. 14. Diarrhea, June 11 to 13.
- No. 15. Intermittent malaria, June 26 and 27; intermittent malaria, June 28 to July 2.
- No. 16. Rheumatism, June 18 to July 23.
- No. 17. Gastritis, July 10 to 17.
- No. 18. Gastritis, July 10 to 17.
- No. 19. Diarrhea, July 15 and 16.
- No. 20. Diarrhea, July 15 and 16.
- No. 21. Diarrhea, July 24 to 27.
- No. 22. Gastro-enteritis, July 30 and 31.
- No. 23. Diarrhea, June 8 and 9.
- No. 24. Intermittent malaria, June 8 and 9.
- No. 25. Intestinal colic, June 18 to 26; gastro-enteritis, June 29 to July 2.
- No. 26. Intermittent malaria, July 11 to 23.
- No. 27. Diarrhea, July 11 to 15.
- No. 28. Diarrhea, July 15 and 16.
- No. 29. Heat exhaustion, May 21 and 22.
- No. 30. Diarrhea, July 20 and 21.
- No. 31. Dysentery, May 31 and June 1.
- No. 32. Gastro-enteritis, June 1 to 3.
- No. 33. Heat exhaustion, June 3 to 5.
- No. 34. Diarrhea, June 6 and 7.
- No. 35. Intermittent malaria, June 23 to 26.
- No. 36. Diarrhea, July 12 to 18.
- No. 37. Diarrhea, July 15 and 16.
- No. 38. Diarrhea, July 22 and 23.
- No. 39. Diarrhea, July 25 to 27.
- No. 40. Diarrhea, July 22 to 24.
- No. 41. Diarrhea, May 20 to 22; intermittent malaria, September 5 to 15.
- No. 42. Diarrhea, May 26 and 27.
- No. 43. Gastro-enteritis, June 3 to 5.
- No. 44. Pleurodynia, June 7 to 10.
- No. 45. Heat exhaustion, June 26 to 28; diarrhea, July 14 to 17.
- No. 46. Diarrhea, July 10 to 14.
- No. 47. Gastritis, July 1 to 12; intermittent malaria, September 4 to 10.
- No. 48. Diarrhea, July 12 to 14; diarrhea, July 15 and 16.
- No. 49. Diarrhea, July 15 and 16.
- No. 50. Diarrhea, July 16 and 17.
- No. 51. Intermittent malaria, May 27 and 28.
- No. 52. Indigestion, May 27 to 30.
- No. 53. Diarrhea, June 13 and 14.
- No. 54. Diarrhea, July 12 and 13.
- No. 55. Diarrhea, July 15 and 16.
- No. 56. Diarrhea, July 15 and 16.
- No. 57. Bronchitis, July 22 to 26.
- No. 58. Diarrhea, July 22 and 23.
- No. 59. Intermittent malaria, July 26 and 27.
- No. 60. Rheumatism, July 30; left incomplete.
- No. 61. Heat exhaustion, June 1 to 4.
- No. 62. Diarrhea, July 16 to 24.
- No. 63. Intermittent malaria, July 23 to 28.
- No. 64. Diarrhea, July 31; left incomplete.
- No. 65. Enteritis, May 28 and 29.
- No. 66. Diarrhea, July 14 and 15.
- No. 67. Diarrhea, July 16 to 23.
- No. 68. Gastro-enteritis, July 18 to 24.
- No. 69. Diarrhea, July 19 to 27.
- No. 70. Heat exhaustion, May 26 and 27.
- No. 71. Dysentery, May 31 and June 1.
- No. 72. Intermittent malaria, June 9 and 10; diarrhea, July 22 and 23.
- No. 73. Neuralgia, June 13 to 17; diarrhea, September 3 to 6.
- No. 74. Gastritis, June 13 to 15.
- No. 75. Diarrhea, July 10 to 14.
- No. 76. Diarrhea, July 11 and 12.
- No. 77. Diarrhea, July 20 to 27.
- No. 78. Diarrhea, July 27 and 28.
- No. 79. Diarrhea, July 30 and 31.
- No. 80. Intermittent malaria, July 31; left incomplete.
- No. 81. Heat exhaustion, May 20 and 21.
- No. 82. Heat exhaustion, June 6 and 7.
- No. 83. Gastro-enteritis, June 21 to 27.
- No. 84. Diarrhea, July 3 to 5.
- No. 85. Diarrhea, July 14 to 17.
- No. 86. Diarrhea, July 15 and 16; intermittent malaria, July 28; left incomplete.
- No. 87. Diarrhea, July 15 and 16.
- No. 88. Gastro-enteritis, July 25 and 26.
- No. 89. Constipation, July 27 to 31.
- No. 90. Heat exhaustion, July 25; left incomplete.
- No. 91. Gastro-enteritis, July 29; left incomplete.
- No. 92. Diarrhea, July 29; left incomplete.
- No. 93. Intermittent malaria, July 31; left incomplete.
- No. 94. Diarrhea, July 31; left incomplete.
- No. 95. Diarrhea, May 31 and June 1.
- No. 96. Intermittent malaria, June 8 and 9; intermittent malaria, June 11 and 12.
- No. 97. Diarrhea, July 16 and 17.
- No. 98. Intermittent malaria, July 25 to 29.
- No. 99. Diarrhea, July 27 and 28.
- No. 100. Diarrhea, July 31; left incomplete.
- No. 101. Heat exhaustion, May 26 and 27.
- No. 102. Diarrhea, June 2 to 5.
- No. 103. Intermittent malaria, June 26 to 28.
- No. 104. Intermittent malaria, July 14 to 16.
- No. 105. Intermittent malaria, July 16 to 26.
- No. 106. Gastro-enteritis, May 28 and 29.
- No. 107. Diarrhea, July 12 to 14.
- No. 108. Diarrhea, July 14 and 15; intermittent malaria, July 16 to 18.
- No. 109. Diarrhea, July 16 and 17; rheumatism, July 17 to 23.
- No. 110. Diarrhea, May 26 and 27; heat exhaustion, May 31 to June 3.
- No. 111. Bronchitis, May 29 to 31.
- No. 112. Diarrhea, June 5 and 6.
- No. 113. Hemorrhage, June 15 to 17.
- No. 114. Neuritis, June 24 to July 21.
- No. 115. Intestinal colic, July 24 to 26.
- No. 116. Bronchitis, June 1 and 2.
- No. 117. Pernicious anæmia, June 5 to 10.
- No. 118. Intermittent malaria, June 11 and 12.
- No. 119. Diarrhea, June 23 to 25.
- No. 120. Intestinal colic, June 11 and 12.
- No. 121. Diarrhea, July 12 and 13; hemorrhage, July 25 to 27. The source of this hemorrhage is not given.
- No. 122. Hemorrhage, July 15 to 17.
- No. 123. Diarrhea, July 15 and 16.
- No. 124. Intermittent malaria, July 16 to 18.
- No. 125. Constipation, July 15 to 17.
- No. 126. Sunburn, June 20 to 23.
- No. 127. Intestinal colic, July 21 and 22.
- No. 128. Migraine, July 22 and 23.
- No. 129. Rheumatism, July 21; left incomplete.
- No. 130. Diarrhea, July 30; left incomplete.
- No. 131. Diarrhea, June 1 to 3.
- No. 132. Inebriety, July 10 and 11; remittent malaria, September 6 to 16.
- No. 133. Gastritis, July 13 to 26.
- No. 134. Cellulitis, July 15 and 16.
- No. 135. Diarrhea, July 26 and 27.

- No. 136. Diarrhea, July 14 and 15.
 No. 137. Diarrhea, June 3 and 4; diarrhea, September 3 to 5.
 No. 138. Intermittent malaria, June 4 to 10.
 No. 139. Bronchitis, June 11 and 12.
 No. 140. Flux, July 3 to 16.
 No. 141. Diarrhea, July 11 to 14.
 No. 142. Lumbago, July 28 and 29; diarrhea, August 4 to 6.
 No. 143. Dysentery, August 31 to September 2.
 No. 144. Diarrhea, July 27 to August 1.
 No. 145. Diarrhea, July 30 to August 4.
 No. 146. Intermittent malaria, July 31 to August 8.
 No. 147. Diarrhea, August 1 and 2; diarrhea, August 8 and 9.
 No. 148. Diarrhea, August 1 and 2; sent to Bellevue Hospital September 9 with remittent malaria.
 No. 149. Intermittent malaria, August 6 to 16.
 No. 150. Dysentery, August 6 to 11.
 No. 151. Intermittent malaria, August 7 to 13.
 No. 152. Diarrhea, August 8 to 13.
 No. 153. Carbuncle, July 4 and 5; diarrhea, July 12 to 14.
 No. 154. Gastro-enteritis, June 13 to 15; diarrhea, August 17 to 19.
 No. 155. Diarrhea, August 18 and 19.
 No. 156. Intermittent malaria, August 19 to 22.
 No. 157. Remittent malaria, August 19 to 22.
 No. 158. Remittent malaria, August 19 to 22.
 No. 159. Intermittent malaria, August 19 to 25.
 No. 160. Diarrhea, August 20 to 22.
 No. 161. Diarrhea, August 20 and 21.
 No. 162. Dysentery, August 21 to 25.
 No. 163. Intermittent malaria, August 21 to 25.
 No. 164. Remittent malaria, August 21 and 22.
 No. 165. Diarrhea, August 21 and 22.
 No. 166. Diarrhea, August 24 and 25.
 No. 167. Diarrhea, August 25 and 26.
 No. 168. Colic, August 25 to 27.
 No. 169. Diarrhea, August 25 to 27.
 No. 170. Intermittent malaria, August 27 to 30.
 No. 171. Diarrhea, August 27 and 28.
 No. 172. Remittent malaria, August 10; disposition not given in either August or September report.
 No. 173. Diarrhea, August 30 to September 2.
 No. 174. Diarrhea, August 31 to September 3.
 No. 175. Diarrhea, May 29 and 30.
 No. 176. Diarrhea, May 31; left incomplete.
 No. 177. Malarial fever, May 31 to June 4.
 No. 178. Diarrhea, August 29 to September 9.
 No. 179. Dysentery, September 3 to 7.
 No. 180. Dysentery, September 6 to 10.
 No. 181. Diarrhea, July 30 to August 2.
 No. 182. Diarrhea, July 30 to August 5.
 No. 183. Intermittent malaria, July 31 to August 5.
 No. 184. Diarrhea, July 31 to August 7.
 No. 185. Diarrhea, July 31 to August 5.
 No. 186. Diarrhea, August 1 and 2; intestinal colic, August 2 to 6; diarrhea, August 26 and 27.
 No. 187. Diarrhea, June 2 to 5; diarrhea, August 1 to 6; diarrhea, September 3 to 5.
 No. 188. Intestinal colic, August 5 to 15.
 No. 189. Diarrhea, August 8 to 10.
 No. 190. Diarrhea, August 10 to 12.
 No. 191. Diarrhea, August 11 and 12.
 No. 192. Diarrhea, June 13 and 14; diarrhea, August 3 and 14.
 No. 193. Diarrhea, July 16 and 17; diarrhea, August 14; deserted August 24.
 No. 194. Diarrhea, August 14 to 16.
 No. 195. Remittent malaria, August 19 to 22.
 No. 196. Diarrhea, August 20 and 21.
 No. 197. Pernicious malaria, August 21 to 25.
 No. 198. Diarrhea, August 22 to 25.
 No. 199. Intermittent malaria, August 22 to 29.
 No. 200. Intermittent malaria, August 23 to 25.
 No. 201. Diarrhea, August 31 to September 6.
 No. 202. Intermittent malaria, August 23; granted sick leave August 29.
 No. 203. Diarrhea, August 24 and 25.
 No. 204. Diarrhea, August 24 and 25.
 No. 205. Diarrhea, August 26 and 27.
 No. 206. Diarrhea, August 26; granted sick leave August 29.
 No. 207. Diarrhea, August 23 and 24; diarrhea, August 27 and 28; diarrhea, August 29 and 30; diarrhea, August 31; left incomplete.
 No. 208. Diarrhea, August 27 and 28; intermittent malaria, September 1 to 10.
 No. 209. Intermittent malaria, August 28; granted sick leave August 31.
 No. 210. Remittent malaria, August 6; left incomplete.
 No. 211. Intermittent malaria, August 26 to September 9.
 No. 212. Diarrhea, August 31 to September 2.
 No. 213. Diarrhea, September 4 to 7.
 No. 214. Remittent malaria, July 29 to August 3.
 No. 215. Intermittent malaria, July 30 to August 2.
 No. 216. Intermittent malaria, July 31 to August 5.
 No. 217. Diarrhea, August 1 and 2.
 No. 218. Diarrhea, August 8 to 10.
 No. 219. Diarrhea, August 8 to 10.
 No. 220. Diarrhea, August 8 to 17.
 No. 221. Diarrhea, August 8 to 11.
 No. 222. Diarrhea, August 12 to 15.
 No. 223. Diarrhea, August 13 and 14.
 No. 224. Intermittent malaria, August 14 to 19; diarrhea, August 20 and 21.
 No. 225. Intermittent malaria, August 15 to 22; diarrhea, August 27 to 30.
 No. 226. Diarrhea, August 18 and 19.
 No. 227. Diarrhea, August 18 and 19.
 No. 228. Diarrhea, August 20 and 21; intermittent malaria, August 25 to 28.
 No. 229. Diarrhea, August 20 to 22.
 No. 230. Intermittent malaria, August 21; granted sick leave August 29.
 No. 231. Diarrhea, August 22 to 24.
 No. 232. Intermittent malaria, August 22 to 26.
 No. 233. Diarrhea, August 23 to 25.
 No. 234. Constipation, July 11 to 14; diarrhea, August 23 to 25.
 No. 235. Intermittent malaria, August 23; granted sick leave August 29.
 No. 236. Diarrhea, July 24 and 25; diarrhea, August 23 to 25.
 No. 237. Diarrhea, August 24 to 26.
 No. 238. Diarrhea, August 24 and 25.
 No. 239. Diarrhea, August 26 and 27.
 No. 240. Intermittent malaria, August 26 and 27.
 No. 241. Nephritis, July 30; left incomplete; intermittent malaria, August 27; granted sick leave August 29.
 No. 242. Diarrhea, July 28 and 29; intermittent malaria, August 26 to September 8.
 No. 243. Intermittent malaria, August 28; left incomplete.
 No. 244. Intestinal colic, August 30 to September 4.
 No. 245. Intermittent malaria, August 28 to September 18.
 No. 246. Remittent malaria, September 3 to 10.
 No. 247. Diarrhea, September 5 to 9.
 No. 248. Intermittent malaria, July 30 to August 2.
 No. 249. Appendicitis, July 31 to August 2; diarrhea, August 24 and 25.
 No. 250. Diarrhea, August 2 and 3.
 No. 251. Intermittent malaria, August 6 to 10.
 No. 252. Diarrhea, August 6 to 8.
 No. 253. Intermittent malaria, August 16 to 25; hysteria, August 25 to 31; diarrhea, September 5 to 8.

- No. 254. Diarrhea, August 24 and 25.
 No. 255. Diarrhea, August 24 and 25.
 No. 256. Diarrhea, August 25 and 26; dysentery, September 4 to 7.
 No. 257. Diarrhea, September 1 to 5.
 No. 258. Diarrhea, September 2 to 5.
 No. 259. Intermittent malaria, June 8 and 9; diarrhea, July 16 to 19; diarrhea, August 2 to 7.
 No. 260. Diarrhea, July 30 to August 2.
 No. 261. Diarrhea, June 11 to 14; diarrhea, July 31 to August 5; heat exhaustion, August 12 to 22.
 No. 262. Diarrhea, August 2 to 4; diarrhea, August 12 and 13.
 No. 263. Diarrhea, August 14 to 16.
 No. 264. Diarrhea, August 14 and 15.
 No. 265. Remittent malaria, August 16 to 21.
 No. 266. Diarrhea, August 17 to 19.
 No. 267. Diarrhea, August 20 and 21; sent to Bellevue Hospital with malaria, September 17.
 No. 268. Heat exhaustion, June 4 and 5; gastritis, July 18 to 21; myalgia, August 21 and 22.
 No. 269. Intestinal colic, July 18 to 20; intermittent malaria, August 22; granted sick leave, August 29.
 No. 270. Remittent malaria, August 22; granted sick leave August 31.
 No. 271. Intermittent malaria, August 24; granted sick leave August 29.
 No. 272. Intermittent malaria, August 25 to 28.
 No. 273. Diarrhea, August 25 and 26.
 No. 274. Dysentery, September 3 to 7.
 No. 275. Diarrhea, September 4 and 5.
 No. 276. Sent to St. Peter's Hospital September 9 with malaria.
 No. 277. Diarrhea, July 30 to August 2; malaria, September 9 to 16.
 No. 278. Diarrhea, August 4 and 5; diarrhea, August 22 and 23; malaria, September 4 to 14.
 No. 279. Diarrhea, August 5 to 7.
 No. 280. Intermittent malaria, August 1 to 13.
 No. 281. Remittent malaria, August 6 to 15.
 No. 282. Diarrhea, August 11 and 12.
 No. 283. Diarrhea, August 11 to 13.
 No. 284. Diarrhea, August 12 and 13.
 No. 285. Diarrhea, August 16 and 17.
 No. 286. Remittent malaria, August 16 to 22.
 No. 287. Diarrhea, August 16 to 19; diarrhea, August 24 and 25.
 No. 288. Diarrhea, August 18 to 20.
 No. 289. Diarrhea, August 19 and 20; remittent malaria, August 22 and 23.
 No. 290. Diarrhea, August 20 to 22; remittent malaria, August 22 to 27.
 No. 291. Diarrhea, August 20 and 21.
 No. 292. Intestinal colic, August 21 to 25.
 No. 293. Intermittent malaria, July 16 and 17.
 No. 294. Pernicious anemia, June 5 to 10; diarrhea, August 25 to 27.
 No. 295. Intermittent malaria, August 25; granted sick leave August 29.
 No. 296. Diarrhea, August 28 and 29.
 No. 297. Intermittent malaria, August 29; left incomplete.
 No. 298. Intermittent malaria, August 29; left incomplete.
 No. 299. Dysentery, August 30 to September 6.
 No. 300. Remittent malaria, September 6 and 7.
 No. 301. Malaria, September 9 to 14.
 No. 302. Rheumatism, July 30 to August 2; rheumatism, August 6 to 8.
 No. 303. Diarrhea, July 30 to August 2; remittent malaria, August 19 to 22.
 No. 304. Intermittent malaria, August 3 to 10.
 No. 305. Intermittent malaria, August 3 to 13.
 No. 306. Intermittent malaria, August 4 to 8.
 No. 307. Intermittent malaria, August 5 to 16.
 No. 308. Intermittent malaria, August 6 to 13.
 No. 309. Remittent malaria, September 6 to 16.
 No. 310. Intestinal colic, August 8 to 10.
 No. 311. Diarrhea, August 8 to 13.
 No. 312. Diarrhea, August 8 to 10.
 No. 313. Diarrhea, July 12 to 15; diarrhea, August 10 and 11; diarrhea, August 25 to 27.
 No. 314. Diarrhea, August 10 to 13.
 No. 315. Intermittent malaria, August 10 to 17.
 No. 316. Diarrhea, August 10 to 12.
 No. 317. Diarrhea, August 12 and 13; intermittent malaria, August 16 to 21.
 No. 318. Diarrhea, August 12 and 13.
 No. 319. Otitis, August 13 to 15; otitis, August 17 to 26.
 No. 320. Diarrhea, July 12 to 14; diarrhea, July 17 to 23; discharged for debility August 13.
 No. 321. Diarrhea, August 15 and 16.
 No. 322. Intestinal colic, August 16 to 20.
 No. 323. Remittent malaria, August 16 to 22.
 No. 324. Diarrhea, August 17 and 18.
 No. 325. Diarrhea, August 20 and 21.
 No. 326. Diarrhea, August 20 and 21; diarrhea, August 29 to September 4.
 No. 327. Diarrhea, August 20 to 22.
 No. 328. Intestinal colic, August 21 to 23.
 No. 329. Intermittent malaria, August 23; sick leave, August 29.
 No. 330. Diarrhea, August 23 and 24.
 No. 331. Intermittent malaria, August 24; granted sick leave August 29.
 No. 332. Diarrhea, August 25 and 26.
 No. 333. Diarrhea, August 25 to 27.
 No. 334. Diarrhea, August 26 and 27.
 No. 335. Diarrhea, August 29 and 30.
 No. 336. Diarrhea, August 29 to 31.
 No. 337. Diarrhea, August 30 to September 9.
 No. 338. Diarrhea, September 6 to 9.
 No. 339. Diarrhea, August 2 to 4.
 No. 340. Diarrhea, August 9 to 13.
 No. 341. Diarrhea, August 9 and 10.
 No. 342. Diarrhea, August 19 to 21; remittent malaria, August 21 to 27.
 No. 343. Remittent malaria, August 20 to 25.
 No. 344. Diarrhea, August 20 and 21; intestinal colic, September 4 to 8.
 No. 345. Intermittent malaria, August 23; granted sick leave August 29.
 No. 346. Diarrhea, August 23 and 24.
 No. 347. Diarrhea, August 25 and 26.
 No. 348. Intestinal colic, August 31 to September 3.
 No. 349. Diarrhea, August 17 to 19; diarrhea, August 28 and 29.
 No. 350. Intestinal colic, June 6 to 8; intermittent malaria, August 24; granted sick leave August 27.
 No. 351. Diarrhea, August 24 to 26; diarrhea, September 3 and 4.
 No. 352. Diarrhea, August 25 and 26; diarrhea, August 29 and 30; diarrhea, August 31 to September 2; remittent malaria, September 4 and 5.
 No. 353. Intestinal colic, June 6 to 8; rheumatism, July 19 to 21; diarrhea, August 30 and 31.
 No. 354. Intermittent malaria, August 29; left incomplete.
 No. 355. Diarrhea, August 30 to September 4.
 No. 356. Intestinal colic, August 31 to September 5.
 No. 357. Intestinal colic, September 4 to 9.
 No. 358. Malaria, September 9 to 16.
 No. 359. Constipation, July 29 to August 2; diarrhea, August 26 and 27.
 No. 360. Diarrhea, July 30 to August 6.
 No. 361. Diarrhea, July 12 to 15; diarrhea, July 30 to August 4.
 No. 362. Diarrhea, July 31 to August 6.
 No. 363. Diarrhea, August 4 to 8; remittent malaria, August 8 to 11; diarrhea, August 26 and 27.

- No. 364. Intermittent malaria, August 8 to 14.
 No. 365. Diarrhea, August 8 and 9.
 No. 366. Diarrhea, August 8 to 10.
 No. 367. Dysentery, August 9 and 10.
 No. 368. Diarrhea, August 10 and 11.
 No. 369. Diarrhea, August 12 and 13; diarrhea, August 18 and 19.
 No. 370. Intermittent malaria, August 12 and 13.
 No. 371. Diarrhea, August 12 and 13.
 No. 372. Intermittent malaria, August 13 to 19; remittent malaria, August 19 to 22.
 No. 373. Diarrhea, August 15 to 18; diarrhea, August 21 and 22.
 No. 374. Diarrhea, August 17 to 19.
 No. 375. Diarrhea, August 17 to 19.
 No. 376. Intestinal colic, August 25 to 28.
 No. 377. Diarrhea, July 30 to August 2.
 No. 378. Intermittent malaria, August 4 to 11.
 No. 379. Diarrhea, August 5 and 6; remittent malaria, August 6 to 10; diarrhea, August 20 to 22.
 No. 380. Intermittent malaria, August 6 to 10; intermittent malaria, August 25; granted sick leave August 29.
 No. 381. Intermittent malaria, August 9 to 13.
 No. 382. Diarrhea, August 10 to 13.
 No. 383. Intermittent malaria, August 17 to 23.
 No. 384. Intermittent malaria, August 18; granted sick leave August 29.
 No. 385. Diarrhea, August 18 and 19; granted sick leave August 21.
 No. 386. Diarrhea, August 20 and 21.
 No. 387. Intestinal colic, August 24 to 27.
 No. 388. Intestinal colic, May 21 to 23; diarrhea, August 25 and 26; dysentery, August 31 to September 2.
 No. 389. Diarrhea, August 26 to 28; diarrhea, August 31 to September 3.
 No. 390. Malaria, September 9 to 13.
 No. 391. Phimosi, July 25 to August 2.
 No. 392. Diarrhea, July 29 to August 2.
 No. 393. Diarrhea, July 30 to August 7.
 No. 394. Diarrhea, August 1 and 2; intermittent malaria, September 3 to 15.
 No. 395. Intestinal colic, August 1 to 6; intermittent malaria, August 6 to 14.
 No. 396. Diarrhea, August 2 to 4.
 No. 397. Diarrhea, August 3 to 5.
 No. 398. Intermittent malaria, August 5 to 11.
 No. 400. Diarrhea, July 12 to 14; diarrhea, August 6 to 18; remittent malaria, August 21 to 27.
 No. 401. Diarrhea, August 7 to 11; diarrhea, August 31 to September 3.
 No. 402. Diarrhea, August 7 to 10; intermittent malaria, August 23 to 27.
 No. 403. Diarrhea, August 8 to 11.
 No. 404. Intermittent malaria, August 8 to 11.
 No. 405. Intermittent malaria, August 8 to 13; intermittent malaria, September 5 to 9.
 No. 406. Gastroenteritis, May 27 to 31; intermittent malaria, August 8 to 13; malaria, September 9 to 12.
 No. 407. Dysentery, August 31 to September 4.
 No. 408. Intermittent malaria, August 9 to 14.
 No. 409. Diarrhea, August 9 and 10; intestinal colic, August 20 and 21; intermittent malaria, August 24 to 28.
 No. 410. Diarrhea, August 10 and 11.
 No. 411. Diarrhea, August 10 to 13.
 No. 412. Diarrhea, August 10 to 12; diarrhea, August 13 and 14.
 No. 413. Diarrhea, August 10 to 12.
 No. 414. Diarrhea, August 10 to 14.
 No. 415. Diarrhea, August 12 and 13; intermittent malaria, August 20; granted sick leave August 29.
 No. 416. Diarrhea, August 12 and 13.
 No. 417. Intermittent malaria, August 13 to 19; diarrhea, August 20 to 22.
 No. 418. Diarrhea, August 14 and 15.
 No. 419. Intermittent malaria, August 14 to 22.
 No. 420. Diarrhea, August 15 to 18; intestinal colic, August 19 and 20.
 No. 421. Intermittent malaria, September 5 to 15.
 No. 422. Diarrhea, August 16 to 19; dysentery, August 20 and 21.
 No. 423. Diarrhea, August 16 to 19; diarrhea, August 31; returned to duty September 9.
 No. 424. Intermittent malaria, August 17 to 22.
 No. 425. Chancroids, August 18 to 22.
 No. 426. Diarrhea, August 18 and 19.
 No. 427. Diarrhea, August 18 and 19.
 No. 428. Hernia, August 18 to 22.
 No. 429. Remittent malaria, August 18 to 23.
 No. 430. Diarrhea, August 19 to 21; diarrhea, August 20 and 21.
 No. 431. Intermittent malaria, August 20; granted sick leave August 29.
 No. 432. Intermittent malaria, August 31; diarrhea, September 6 and 7; returned to duty September 15.
 No. 433. Diarrhea, August 29; returned to duty September 3.
 No. 434. Diarrhea, August 20 and 21.
 No. 435. Intermittent malaria, August 20; granted sick leave August 29.
 No. 436. Intestinal colic, August 20 and 21; remittent malaria, August 21 to 23.
 No. 437. Diarrhea, August 21 and 22.
 No. 438. Intermittent malaria, August 22 to 27.
 No. 439. Remittent malaria, August 22 and 23.
 No. 440. Diarrhea, August 23 to 25; diarrhea, August 26 to 28.
 No. 441. Intermittent malaria, August 23 to 27.
 No. 442. Diarrhea, August 23 and 24.
 No. 443. Diarrhea, August 23 to 25.
 No. 444. Intermittent malaria, August 24; granted sick leave August 29.
 No. 445. Diarrhea, August 25 to 27.
 No. 446. Diarrhea, August 25 to 28.
 No. 447. Diarrhea, August 25 and 26.
 No. 448. Diarrhea, August 25 and 26.
 No. 449. Diarrhea, August 26 and 27.
 No. 450. Intermittent malaria, August 26 to 29.
 No. 451. Diarrhea, August 27 and 28.
 No. 452. Intermittent malaria, August 25; returned to duty September 4.
 No. 453. Intermittent malaria, August 27; returned to duty September 9.
 No. 454. Diarrhea, September 4 to 6.
 No. 455. Diarrhea, September 4 to 9.
 No. 456. Malaria, September 9 to 12; sent to Long Island Hospital without date.
 No. 457. Diarrhea, September 4 to 6.
 No. 458. Diarrhea, September 5 to 8.
 No. 459. Intestinal colic, September 6 to 10.
 No. 460. Remittent malaria, September 9 to 12; sent to Bellevue Hospital without date.
 No. 461. Diarrhea, July 31; returned to duty August 1; diarrhea, August 13 to 16.
 No. 462. Intermittent malaria, August 4 to 8.
 No. 463. Diarrhea, August 6 and 7; diarrhea, August 20 and 21.
 No. 464. Diarrhea, August 11 to 14; remittent malaria, August 14.
 No. 465. Intermittent malaria, August 16 to 21.
 No. 466. Diarrhea, August 20 to 23.
 No. 467. Diarrhea, August 20 and 21.
 No. 468. Tonsillitis, July 26; returned to duty August 2; diarrhea, August 20 to 22; diarrhea, August 24 and 25.
 No. 469. Constipation, July 16 and 17; rheumatism, July 28 to 30; diarrhea, July 30; returned to duty August 4.
 No. 470. Diarrhea, August 2 to 10.
 No. 471. Gonorrhea, August 3 to 13; gonorrhea, September 3.
 No. 472. Diarrhea, June 12 to 15; diarrhea, August 6 and 7; toxin

poisoning, August 7 to 9; toxin poisoning, August 9 to 11; remittent malaria, August 14 to 17.

No. 473. Heat exhaustion, June 2 and 3; diarrhea, August 8 to 13; intermittent malaria, August 27; granted sick leave August 29.

No. 474. Diarrhea, August 9 to 12.

No. 475. Gastroenteritis, July 17 to 20; diarrhea, August 13 and 14; intermittent malaria, August 19; granted sick leave August 29.

No. 476. Diarrhea, August 15 to 19; remittent malaria, August 19; sent to hospital without date; returned to duty September 6.

No. 477. Diarrhea, August 15 to 19.

No. 478. Diarrhea, July 15 to 17; intestinal colic, July 26 and 27; diarrhea, August 16 to 19; intermittent malaria, August 26; granted sick leave August 29.

No. 479. Intermittent malaria, August 18; granted sick leave August 29.

No. 480. Diarrhea, August 20 to 22.

No. 481. Diarrhea, August 26 and 27.

No. 482. Diarrhea, August 31; returned to duty September 3.

No. 483. Diarrhea, August 29; returned to duty September 3; malaria, September 9 and 10.

No. 484. Intermittent malaria, July 25; intermittent malaria, July 27 and 28; returned to duty August 5.

No. 485. Diarrhea, August 3 to 6; remittent malaria, August 4 to 6.

No. 486. Intermittent malaria, August 4 to 11.

No. 487. Diarrhea, August 8 to 10.

No. 488. Diarrhea, June 11 and 12; diarrhea, August 12 to 14.

No. 489. Diarrhea, August 15 to 19.

No. 490. Diarrhea, August 22 to 25.

No. 491. Diarrhea, August 22 and 23.

No. 492. Intermittent malaria, August 23 to 27.

No. 493. Diarrhea, August 25 and 26.

No. 494. Diarrhea, July 14 and 15; diarrhea, July 29; returned to duty August 2.

No. 495. Diarrhea, July 30; returned to duty August 2; diarrhea, August 20 and 21; diarrhea, September 3 to 6.

No. 496. Diarrhea, July 31; returned to duty August 10; diarrhea, August 9 to 12; intermittent malaria, August 13 to 19; intermittent malaria, August 20; granted sick leave August 29.

No. 497. Diarrhea, July 31; returned to duty August 4.

No. 498. Diarrhea, July 14 to 17; adenitis, July 26 and 27; gonorrhea, August 3 to 26.

No. 499. Remittent malaria, August 6 to 11.

No. 500. Remittent malaria, August 6 to 12.

No. 501. Intestinal colic, August 8 to 11.

No. 502. Intermittent malaria, August 9 to 14; diarrhea, August 20 to 25.

No. 503. Diarrhea, August 9 to 11.

No. 504. Intermittent malaria, August 10 to 15; intermittent malaria, August 19 to 23.

No. 505. Diarrhea, August 15 to 17.

No. 506. Intermittent malaria, August 17 to 23.

No. 507. Diarrhea, August 17 to 19.

No. 508. Diarrhea, August 18 to 21.

No. 509. Diarrhea, August 18 and 19.

No. 510. Diarrhea, August 18 and 19; intermittent malaria, September 4 to 12.

No. 511. Intestinal colic, August 19 to 23.

No. 512. Diarrhea, August 20 to 22.

No. 513. Diarrhea, August 21 to 25.

No. 514. Intermittent malaria, August 21; granted sick leave August 29.

No. 515. Diarrhea, August 22 and 23.

No. 516. Diarrhea, June 10 to 12; gastroenteritis, June 18 to 25; intermittent malaria, August 22 to 29; granted sick leave August 29.

No. 517. Diarrhea, August 22 and 23.

No. 518. Diarrhea, August 24 to 26.

No. 519. Intermittent malaria, August 24; granted sick leave August 29.

No. 520. Diarrhea, August 25 and 26.

No. 521. Intermittent malaria, August 25; granted sick leave August 29.

No. 522. Diarrhea, August 26.

No. 523. Diarrhea, August 26 to 28.

No. 524. Intestinal colic, July 26 and 27; diarrhea, August 26 to 28.

No. 525. Diarrhea, August 27 and 28.

No. 526. Diarrhea, August 27 and 28.

No. 527. Rheumatism, July 21; returned to duty August 5.

No. 528. Constipation, July 15 to 29; constipation, July 29; hernia, July 29; returned to duty August 13.

No. 529. Diarrhea, July 30; returned to duty August 2.

No. 530. Intermittent malaria, July 30; returned to duty August 6.

No. 531. Myalgia, July 27 and 28; gastritis, July 30; returned to duty August 2.

No. 532. Gastroenteritis, July 31; returned to duty August 6.

No. 533. Heat exhaustion, July 31; returned to duty August 5.

No. 534. Tænia, July 29 and 30; diarrhea, July 31; returned to duty August 2.

No. 535. Diarrhea, July 31; returned to duty August 4.

No. 536. Gastritis, August 2 to 6.

No. 537. Intermittent malaria, August 3 to 7.

No. 538. Diarrhea, August 4 to 6.

No. 539. Diarrhea, August 6 to 8.

No. 540. Dysentery, August 6 to 11; diarrhea, August 9 to 11; intestinal colic, August 30; returned to duty September 3.

No. 541. Diarrhea, August 6 and 7; intestinal colic, August 28; returned to duty September 3.

No. 542. Diarrhea, August 7 to 13.

No. 543. Bronchitis, July 2 to 5; diarrhea, August 8 to 10.

No. 544. Diarrhea and vomiting, June 11 to 15; diarrhea, August 8 to 10; intermittent malaria, August 20 to 29.

No. 545. Intestinal fermentation, June 18 to 22; diarrhea, August 8 to 11.

No. 546. Intermittent malaria, August 8 to 10.

No. 547. Diarrhea, July 26 and 27; intestinal colic, August 8 to 12.

No. 548. Intermittent malaria, August 9 to 13.

No. 549. Diarrhea, August 10 to 14; diarrhea, August 28; granted sick leave August 30.

No. 550. Diarrhea, August 11 to 13.

No. 551. Diarrhea, August 13 and 14.

No. 552. Diarrhea, July 12 to 15; intermittent malaria, August 13 to 17.

No. 553. Intermittent malaria, August 14 to 19.

No. 554. Diarrhea, August 14 and 15; intermittent malaria, August 29.

No. 555. Diarrhea, August 16 and 17.

No. 556. Remittent malaria, August 19 to 23.

No. 557. Remittent malaria, August 19 to 27.

No. 558. Diarrhea, August 20 to 27.

No. 559. Diarrhea, August 21 to 22.

No. 560. Diarrhea, May 21 and 22; intermittent malaria, August 22; granted sick leave August 29.

No. 561. Diarrhea, June 2 to 5; intermittent malaria, August 22; granted sick leave August 29.

No. 562. Intermittent malaria, August 22; granted sick leave August 29.

No. 563. Diarrhea, August 22 and 23.

No. 564. Remittent malaria, August 23; granted sick leave August 31.

No. 565. Diarrhea, August 23 and 24.

No. 566. Diarrhea, August 23 and 24; diarrhea, August 26 to 28.

No. 567. Diarrhea, August 23 and 24; diarrhea, September 5 to 7.

No. 568. Diarrhea, August 24 and 25; diarrhea, August 29.

No. 569. Diarrhea, August 24 and 25; diarrhea, September 4 to 7.

No. 570. Intermittent malaria, August 24; granted sick leave August 29.

No. 571. Intermittent malaria, August 25; granted sick leave August 29.

No. 572. Diarrhea, August 29 and 30.
 No. 573. Diarrhea, August 30 and 31.
 No. 574. Diarrhea, August 30 and 31.
 No. 575. Intermittent malaria, August 25.
 No. 576. Intestinal colic, August 28.
 No. 577. Diarrhea, August 30 and 31; returned to duty September 8.
 No. 578. Intestinal colic, August 31; returned to duty September 6.
 No. 579. Dysentery, May 30; returned to duty June 2.
 No. 580. Diarrhea, July 12 to 14; intermittent malaria, July 22; returned to duty August 1; remittent malaria, August 16 and 17.
 No. 581. Intermittent malaria, July 30; returned to duty August 2; diarrhea, August 16 to 19; intermittent malaria, August 20; granted sick leave August 29.
 No. 582. Diarrhea, August 6 and 7.
 No. 583. Diarrhea, August 8 and 9.
 No. 584. Diarrhea, August 10 to 12.
 No. 585. Remittent malaria, August 10 to 16.
 No. 586. Diarrhea, August 17 to 19; intestinal colic, September 1 to 10.
 No. 587. Diarrhea, August 18 to 20.
 No. 588. Diarrhea, July 12 to 14; diarrhea, August 24 to 26.
 No. 589. Otitis, June 23; returned to duty July 8; diarrhea, July 24 and 25; otitis, August 30; returned to duty September 27.
 No. 590. Dysentery, August 30 to September 5.
 No. 591. Remittent malaria, September 6 to 9; malaria, September 9; sent to Bellevue Hospital without date.
 No. 592. Lymphangitis, August 21; granted sick leave August 29.
 No. 593. Intestinal colic, September 1 to 5.
 No. 594. Diarrhea, July 30; returned to duty August 8; diarrhea, September 1 to 3.
 No. 598. Diarrhea, July 30; returned to duty August 2.
 No. 596. Pneumonia, July 20 to 25; intermittent malaria, July 30; returned to duty August 1.
 No. 597. Intestinal colic, July 20 to 22; diarrhea, July 30; returned to duty August 2.
 No. 598. Intermittent malaria, July 31; returned to duty August 3; diarrhea, August 24 to 26.
 No. 599. Diarrhea, August 1 and 2.
 No. 600. Remittent malaria, August 1 to 5.
 No. 601. Intermittent malaria, August 4 to 11.
 No. 602. Diarrhea, August 5 and 6; diarrhea, August 18 and 19; remittent malaria, August 19; granted sick leave August 27.
 No. 603. Diarrhea, September 4 to 8.
 No. 604. Intermittent malaria, August 5 to 12.
 No. 605. Intermittent malaria, August 6 to 15.
 No. 606. Intermittent malaria, August 6 to 11.
 No. 607. Diarrhea, August 9 and 10; diarrhea, August 30; returned to duty September 6.
 No. 608. Intermittent malaria, August 10 to 19; remittent malaria, August 19 to 22.
 No. 609. Diarrhea, August 12 to 14.
 No. 610. Remittent malaria, August 14 to 20; diarrhea, August 26 and 27.
 No. 611. Diarrhea, August 15 to 19.
 No. 612. Diarrhea, August 16 to 18.
 No. 613. Diarrhea, July 31; returned to duty August 4.
 No. 614. Diarrhea, June 7 to 9; diarrhea, August 17 to 19.
 No. 615. Diarrhea, August 20 and 21.
 No. 616. Diarrhea, August 20 and 21.
 No. 617. Intestinal colic, August 20; bronchitis, August 22; granted sick leave August 29.
 No. 618. Diarrhea, August 20 and 21.
 No. 619. Heat exhaustion, July 23 to 30; intermittent malaria, August 22; granted sick leave August 29.
 No. 620. Remittent malaria, August 22; granted sick leave August 31.
 No. 621. Diarrhea, August 24 and 25.

No. 622. Gonorrhea, August 24 to 28.
 No. 623. Diarrhea, August 25 to 27; intestinal colic, August 30; returned to duty September 5.
 No. 624. Diarrhea, August 25 to 28; diarrhea, August 29; returned to duty September 5.
 No. 625. Diarrhea, August 26 to 28.
 No. 626. Diarrhea, June 2 and 3; hysteria, July 21 and 22; diarrhea, August 30 and 31.
 No. 627. Diarrhea, August 29; returned to duty September 14.
 No. 628. Intestinal colic and intermittent malaria, August 31; returned to duty September 18.

SUMMARY.

Assembled at Peekskill, N. Y., in April, 1898.
 Mustered into United States service between May 6 and 21, 1898.
 Arrived at Chickamauga Park, Ga., May 25, 1898.
 Strength on arrival, 849.
 Date of first case of probable typhoid fever, June 24, 1898.
 Date of first case of recognized typhoid fever, June 24, 1898.
 Left Chickamauga Park, Ga., September 6, 1898.
 Strength on departure, 1,301.
 Number of probable cases of typhoid fever developed at Chickamauga 390 (?)
 Arrived in New York City about September 9, 1898.
 Furloughed in New York City September 9, 1898.
 Number of probable cases of typhoid fever developed after leaving Chickamauga 35 (?)
 Total number of probable cases of typhoid fever developed in the Eighth New York Volunteer Infantry from May to September, 1898..... 425
 These 425 cases were diagnosed as follows:
 Typhoid fever..... 190
 Malaria..... 212
 Diarrhea..... 22
 Intestinal colic 1
 Total 425

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Amann, Jacob.....	Pvt., A.	Sept. 3	Camp Thomas, Ga....	Typhoid.
Black, James.....	Pvt., K.	July 30	Lytle, Ga.....	Do.
Clarke, W. F.....	Hosp. S.	Aug. 26	New York City.....	Pneumonia.
Clevenger, W. A.....	Artificer, C.	Sept. 5	Chickamauga, Ga....	Typhoid.
Daly, John A.....	Pvt., E.	Sept. 14	Long Island City, N. Y.	Do.
Duff, William P.....	Sgt., H.	Sept. 16	Long Island College Hospital, Brooklyn, N. Y.	Do.
Duncan, Thomas S....	Pvt., F.	Sept. 8	St. Luke's Hospital, New York City.....	Do.
Durand, Frank.....	Pvt., I.	Sept. 17	New York City.....	Do.
Feit, Adam, jr.....	Pvt., H.	Sept. 14	.....do.....	Do.
Glover, Joseph.....	Mus., L.	Sept. 6	Mount Vernon, N. Y.	Do.
Grossman, G. H.....	Pvt., M.	Sept. 30	New York City.....	Do.
Jones, W. S. H.....	Pvt., A.	Sept. 12	Camp Thomas, Ga....	Do.
Kelly, M. J.....	Q.M.sgt.	July 1	.....do.....	Do.
Law, Charles A.....	Pvt., F.	Aug. 17	Chickamauga, Ga....	Do.
Lindheim, George.....	Asst. surg.	Sept. 16	New York City.....	Do.
O'Brien, Mortimer.....	Pvt., E.	Aug. 24	Chickamauga, Ga....	Do.
Patterson, H. D.....	Pvt., G.	Aug. 21	Camp Thomas, Ga....	Peritonitis and typhoid fever.
Rany, Joseph.....	Pvt., K.	Sept. 24	.....do.....	Typhoid.
Rosenbohm, A.....	Pvt., A.	Sept. 21	New York City.....	Do.
Schilling, F.....	Pvt., D.	Aug. 23	Camp Thomas, Ga....	Do.
Storm, Howard J.....	Sgt., B.	Aug. 13	Chickamauga, Ga....	(Typhoid); neutraemia.
Von Hillebrandt, O....	Corpl. B.	Aug. 30	Camp Thomas, Ga....	Typhoid.
Young, Charles.....	Pvt. K.	Sept. 26	Chickamauga, Ga....	Do.

Total deaths..... 23
 Deaths due to typhoid fever 22
 Percentage of deaths among probable cases (425) of typhoid fever, 5.17.
 Percentage of deaths among recognized cases (190) of typhoid fever, 11.58.

It will be observed that the number of probable cases of typhoid fever in this regiment is greatly in excess of that in any other regiment of this division. For this reason we have made alphabetical lists of all the sick from all causes found on the regimental reports.

We will now attempt a critical study of the sickness in this regiment. In doing this we will first give attention to the group of cases of recognized typhoid fever. These cases naturally fall into two classes:

(a) Those recognized as typhoid fever by the regimental surgeons.

(b) Those sent to the hospitals under some other diagnosis and first recognized as typhoid fever by the surgeon in charge of the hospital.

The first class includes the following cases: Nos. 1 to 72 inclusive, and Nos. 76, 86, 92, 94, 95, 140, 141, 170, 171, 172, 180, 182, 187, 188, 189, and 190—88 in all.

Of the 102 cases first recognized as typhoid fever in the hospital, 88 apparently have the initial date of the typhoid fever on September 9, 1898. These cases are interesting, probably more interesting than they would have been had they been correctly diagnosed at first. The most superficial examination of the data given above will convince anyone that September 9 was not the true initial date of the typhoid fever in the majority of these cases, probably in none of them, although in a few there is no record of previous illness. From a study of these cases we draw the following conclusions:

1. Some of these patients were convalescing from typhoid fever when the disease was first recognized. Cases 114, 127, 128, 142, 143, 144, 145, 148, 149, 152, 153, 154, and 155 are examples of this. The true initial date in many of these cases can be determined by an inspection of the data given with each case. In others there is no record of any illness previous to September 9. Cases 78, 83, 84, 85, 90, 98, 99, 102, 103, 104, 108, 110, 115, 118, 119, 121, 125, 130, 132, 134, 135, 139, 143, 145, 156, 157, 164, 167, and 188 are examples. In still other cases the preceding recorded illness evidently had nothing to do with the typhoid fever first reported September 9. Cases 113, 124, 150, and 152 are examples. In all of these cases we are compelled to accept as a matter of record September 9 as the initial date, although it is quite evident that this is not always true. This is certainly not true in cases 98, 110, 143, 145, and 152 and is not probable in many others. For instance, in No. 98 typhoid fever was recognized September 9 and the patient died eight days later. It is more than probable that the disease had existed for some time previous to September 9. In No. 110 death occurred ten days after the disease was recognized. While we do not deny the possibility of death occurring so soon after the initial date of the disease, the greater probability is that the disease had made considerable progress before its true character was recognized according to the records. In cases 143, 145, and 152 the patients were returned to duty after eight days for one and after five days for each

of the others. There can be no doubt about the accuracy of the diagnosis in these cases, since the men were in three of the best hospitals in New York. However, the fact that they were "returned to duty" must not be supposed to indicate that they were strong enough to resume the duties of soldiers in the field or in camp. The regiment had been furloughed and the "returned to duty" probably means nothing more than that these men were considered well enough to be taken from the hospitals to their homes. Making all due allowance, it must be admitted that in all probability these men were convalescing from typhoid fever when they were admitted to hospital, and the true initial dates of illness must have been some considerable time prior to September 9.

2. In studying the data before us we are forced to conclude that among soldiers, more often probably than in civil practice, typhoid fever is often far advanced before it is recognized. The facts already given demonstrate this, and render further comment on this point unnecessary. That this is a potent factor in the spread of typhoid fever in camps must be evident. With as many unrecognized cases of typhoid fever as there were in this regiment, and with these men defecating in the pits and on the grounds over which men walked, drinking from the same water receptacles, eating at the same messes, and occupying tents in common with others, the chances for the transmission of the specific infection were great, as the history of this and other regiments in our camps during the summer of 1898 demonstrates.

3. In military practice typhoid fever is often apparently an intermittent disease. In our opinion, many of the cases in the lists made from this regiment illustrate this fact. Let us take a few examples: No. 133 had so-called intermittent malaria August 10, and was returned to duty August 15. Four days later he is registered with diarrhea, and reports under this diagnosis for two consecutive days. On the morning of August 21 he is apparently well enough to be returned to duty, but before the day is over he reports to the surgeon in charge again. This time his disease is diagnosed as remittent malaria, and he is evidently carried on the sick list under this diagnosis until September 9, when he is transferred to the Presbyterian Hospital in New York City and the true nature of the disease from which he has been suffering is for the first time recognized. No. 162 is reported with diarrhea from July 17 to 19; was on duty for five days; was carried on sick report under the diagnosis of diarrhea for three days; on the same day in which he was returned to duty his name was entered on the sick report with intermittent malaria, which continued to August 29, 1898. When he reached the New York hospital, September 9, he was convalescing from typhoid fever. The reader, if he cares to do so, may easily detect a number of similar cases. We have stated that these are "apparently" intermittent fevers. We do not intend to state that

these apparent intermissions were afebrile. It is probable that a temperature record would show that this was not the case. We mean when we state that they were apparently intermittent that there were periods when the patients felt better, and for this reason were returned to duty.

Proceeding to our second list of cases, which includes those believed by us to have been typhoid fever but which were never diagnosed as such, we ask that a comparison be made between the first and second lists, when one will readily see reasons for our belief.

Suppose that the 102 cases in the first group which were not recognized as typhoid fever by the regimental surgeons had never gone to the hospitals, would their true nature have been more clearly discernible than is the true nature of the illness in the second list of cases? After studying the data given, and after knowing that Professor Dock and Doctor Craig found only one or two cases of malaria in the hundreds of sick at Chickamauga Park, and that these cases yielded promptly to single doses of quinine, we can not come to any other conclusion than that the cases of the second list were as certainly typhoid fevers as were those of the first list. It might be asked why the mortality was so much smaller in the second group than in the first group. In the first group there are 190 cases, with 13 reported deaths; in the second group there are 187 cases, with only 3 reported deaths. Moreover, in the first group there are only 62 completed cases, with 13 deaths, while in the second group there are 95 completed cases, with only 3 deaths. However, it is more than probable that some of the cases in the first group were diagnosed typhoid fever because they died, and there is no doubt that the first group contains a larger number of the more serious cases.

In the third group or list the following cases may have been typhoid fever: Nos. 202, 206, 207, 209, 230, 235, 241, 245, 267, 269, 270, 271, 278, 280, 295, 320, 329, 331, 345, 350, 379, 380, 384, 385, 415, 431, 432, 435, 444, 461, 472, 476, 479, 496, 514, 519, 521, 560, 561, 562, 564, 570, 571, 581, 602, 617, 619, and 620—48 in all. We will call these possible cases of typhoid fever. Adding these three groups we have the following:

Cases of recognized typhoid fever.....	190
Cases of probable typhoid fever.....	187
Additional cases of possible typhoid fever.....	48
Total cases of possible typhoid fever.....	425

Twenty-two deaths in 425 cases gives a mortality of 5.17 per cent.

The history of this regiment studied along with the histories of certain other regiments, notably the Fifteenth Minnesota and the Two hundred and third New York in the Second Army Corps, seems to indicate that when a regiment is saturated, as it were, with the typhoid infection about one-third of the men are susceptible to the disease.

The first recognized case of typhoid fever in this regiment had its initial date, according to the regimental record, on June 24. However, the fact that this man died July 1 leads to the suspicion that he might have been sick some days before the recorded initial date. So far as we can ascertain from a study of the regimental and hospital records, this was the first possible case of typhoid fever in this regiment. This command reached Chickamauga, as has been stated, May 25, 1898. It is impossible to determine with any certainty whether the first case received the infection before or after arrival at Chickamauga. The probabilities seem to be that this regiment reached Chickamauga free from typhoid infection. Whether the disease was brought in by recruits or introduced from infected regiments at Chickamauga we have no means of determining.

In the third group or list 446 individuals are reported as having had some intestinal disorder. Some of these individuals had two or more attacks and some are recorded as having had both some intestinal disorder and some form of malaria. As far as we can judge from the records, very few of those who had typhoid fever show any evidence of a previous intestinal disorder. A careful study of the list of 190 cases of recognized typhoid fever convinces us that more than 80 per cent of these had neither intestinal disorder nor so-called malaria previous to infection with typhoid fever. The change in diagnosis from malaria to typhoid fever renders this apparently not true, but an inspection of the recorded data convinces anyone that in the majority of these cases the recorded previous illness was really a part of the typhoid fever. In some of the cases which we have excluded from the list of those without previous illness, the recorded previous illness was probably a part of the typhoid fever. The following cases are illustrations: Nos. 31, 36, 38, 44, 53, 80, 91, 92, 161, and 169.

In the second list containing the probable cases of typhoid fever the number without preceding intestinal disorders is more than 90 per cent of the whole. Indeed, we find that it is true of this regiment and of other regiments in general that the men who had typhoid fever had not had a preceding intestinal disorder. The converse of this is also true, that the men who had temporary intestinal disorders did not as a rule subsequently have typhoid fever. The only conclusion that we can draw from this is that many of the temporary intestinal disorders must have given at least partial and temporary immunity from typhoid fever. This means that many of the temporary intestinal disorders must have been accompanied by typhoidal infection. Studying this question more closely we find that the diarrheas of May and June gave less protection against typhoid fever than did the diarrheas of July and August. This is true not only of this regiment but of others as well. In other words, the intestinal disorders of short dura-

tion that prevailed among the troops simultaneously with the wide spread of typhoid fever protected against typhoid fever, while the intestinal disorders of short duration that prevailed before the typhoid fever infection became widespread did not, at least as greatly, protect against typhoid fever. The most plausible explanation of this seems to us to be the following: Among the troops typhoid fever was in the majority of instances spread by infection of food by means of flies, by dust, and by infected hands. A fly feeding upon infected feces in a sink alights upon some article of food. Here the fly probably deposits colon bacilli and other putrefactive germs in great numbers and typhoid bacilli in relatively small numbers. The former being present in great numbers causes within a few hours a profuse diarrhea which sweeps out of the intestines not only the putrefactive organisms but the greater part of the typhoid bacilli and the man escapes with a diarrhea, and at the same time acquires some immunity to typhoid fever. In other words, the infection is a mixed one in which the specific bacilli are greatly in the minority, and the effect of the putrefactive germs results not only in preventing serious typhoid infection but in establishing some degree of immunity to subsequent invasions of the typhoid bacillus.

COMMUNICATIONS FROM THE SURGEONS OF THE EIGHTH NEW YORK VOLUNTEER INFANTRY.

Medical officers.

Louis K. Neff, major and surgeon, New York City, N. Y.

Herman A. Haubold, captain and assistant surgeon, New York City, N. Y.

Captain Haubold thinks that typhoid fever was carried to Chickamauga by infected soldiers, and that the chief agent in its distribution was the drinking water.

GENERAL REMARKS CONCERNING TYPHOID FEVER IN THE FIRST DIVISION OF THE THIRD ARMY CORPS.

Our knowledge concerning the conditions existing among the regiments of this division at Chickamauga is meager and fragmentary. When we reached Chickamauga on our tour of inspection all the regiments of this division had departed. We obtained the testimony of Maj. Guy L. Edie, who for some time acted as sanitary inspector for this division. To this testimony we are indebted for the following information. Major Edie reached Chickamauga August 3, 1898, and began immediately to inspect these regiments. When asked as to the condition found in this inspection, he made the following statement:

I found that nearly all the companies had kitchen sinks within a few feet of the kitchens. These sinks consisted of shallow pits which when filled were covered with earth. Into these, kitchen refuse and slops were thrown. The privy vaults were dug to the rear, some of them at the proper distance, but very shallow and wide, and the contents were imperfectly covered. Some of these pits were not more than 2 feet deep. Neither earth nor lime had

been thrown upon the contents. They were in a very filthy condition and contained myriads of flies. I found the camp of the Third United States Cavalry very bad. I went through the companies and told the captains that they would probably have a great deal of sickness. I rode through the woods adjoining this camp and saw at that time fourteen men defecating in the woods. There were probably more, for there was a long stretch of the woods. With the exception of two regiments, the locations of all the organizations of this division were pretty good, but the sinks were in a miserable condition. Most of these regiments had remained in the same location since coming to this place. Efforts had been made, as I found out afterwards, to change the sites of the camps. I advised that the regiments be moved out of the woods into the sunlit fields, but was told that a man had a lease of these fields and that time would be necessary in order to get a permit to occupy them. Later lime was obtained, and I instructed each regimental and brigade surgeon to see that each regiment had a barrel of lime each day and that it be used freely for both kitchen and company sinks. I also advised that the kitchen refuse be hauled away and that the company sinks be dug deeper and the contents be covered with earth and lime each day. At that time there was not sufficient tentage for the sick, and some of them were compelled to lie under flies. A number of the hospital tents did not have floors. The quartermaster was directed to make requisitions for the lumber needed for flooring and for hospital tents. I brought these requisitions over to headquarters and had them approved. I then went and saw the quartermaster, and very shortly afterwards a sufficient quantity of hospital tents and lumber for flooring were furnished for the division hospital.

I recommended that the men be compelled to boil the water taken from the hydrant, and an order to this effect was issued. However, I believe that this order was not fully obeyed. Men frequently drank from the hydrants, and at two reviews I saw men filling their canteens from the hydrants. This water was obtained from Chickamauga Creek. A number of the regiments, however, hauled their water from springs outside the park, principally from Blue Spring and Park Spring. There was one driven well in this division, and individually the men used water from this well. This was especially true of the ambulance corps and of the Eighth New York Volunteer Infantry. The water obtained from Blue Spring was cloudy. The water obtained from the pipes was abundant in quantity, but of suspicious quality. In regard to obtaining the water from the springs, there were not enough barrels for storing this water until latterly, when a sufficient supply of barrels was obtained.

Many huckster wagons were driven through the camps, and milk from these was generally sold to the soldiers. This milk was of doubtful quality. The milk for the hospitals was sent from Biltmore, N. C., and we received about 200 gallons of this each day. This milk was supposed to be good. An order was issued to keep vendors of milk outside the limits of the division.

The regimental and brigade officers were requested to have the fruits and melons offered for sale among the men inspected and to permit the sale of only those that were apparently good.

When asked whether or not he had formed any opinion concerning the source and the manner by which typhoid fever was spread throughout this division, Major Edie made the following statement:

I thought that the piped water supply was infected and there was ample opportunity for the food around the kitchens to get infected by the flies. The fecal matter in the pits was not covered, as I have stated. The cook at the division hospital called my attention to the fact that when they were using lime freely around the sinks the flies alighting upon the food had their feet covered with lime. The great increase in typhoid fever was immediately after heavy rains—I should say about ten days or two weeks after heavy rains. We had some typhoid fever before that time, but

the great influx of typhoid cases came after the heavy rains. There were also numerous wet-weather springs in the hollows and many of the companies used this water. I saw soldiers drinking from these springs and cautioned them against it. They thought that it was good water, but it was nothing but a wet-weather spring.

In regard to the hospital of the First Division of the Third Army Corps, Major Woodhull, in a report to the Surgeon-General, under date of August 7, 1898, makes the following statement:

At the time of my inspection, July 27, the hospital control was just being assumed by a newly arrived officer, who could not be regarded as responsible for its defects nor be credited with its advantages. The staff consists of 5 medical officers, and the enlisted force was 95 noncommissioned officers and privates of the Hospital Corps. The hospital consists of 30 hospital tents for all purposes, containing at this date 179 patients. The tents are too crowded, containing 8 patients apiece, and they have had 10. There is insufficient space between the wards, the grounds are not adequately ditched, and the approach to the patients' sinks is very poor. The sinks themselves are very bad. The hospital is not divided into brigades.

The Red Cross supplies about one-half of the clothing and the bedding. The floors that have been supplied the tents were furnished by regimental means. The hospital fund started with \$50, and there was \$48 at the end of the month, but considerable expenditures had been made by emergency funds supplied by the regiments. Very serious complaints are made as to the inadequacy of the medical supplies. No atropine is on hand and the salol has been bought by private means. The chloroform supplied from the 1st to 10th of June was regarded as inert, although this might depend on the inexperience of the administrator in open-air work, but the bottles contained a small part of the marked contents. Chocolate-coated quinine tablets in stock, Parke, Davis & Co., tablet 125 (563360 in red), are insoluble and found in the stools. I am informed in Washington that this is not supplied by the Medical Department. It was evidently regarded there as part of the regular supplies. The food as a whole is good and the special diet kitchen was very neat and appeared excellent. Two of a case of twelve sides of bacon then on hand were bad, and I personally observed the maggots in them. There was only one very small coffee mill, apparently belonging to a mess chest, for the whole hospital, and one man was employed all day in grinding coffee. The average duration of treatment, excluding the typhoid cases, is stated at three or four days. Cases are transferred to Leiter and to McPherson general hospitals. Fifty men are employed as nurses and are on duty from twelve to eighteen hours continuously day by day. As far as observed, all the hospital cases of this division were taken into the hospital.

In looking over the list of cases of probable typhoid fever in this division one is at once struck by the much greater number of cases in the Eighth New York than in any other regiment of the division. Since all of these regiments used the Chickamauga Creek water, we must conclude that the great prevalence of typhoid fever in the Eighth New York must have been due to some special local condition, and that water infection could

not have been the most important factor in the spread of typhoid fever in this division. While we did not reach Chickamauga in time to inspect the regiments of this division, the general statement was made to us that the camp of the Eighth New York was especially filthy. Whether or not the men of this regiment received the typhoid infection from the water of the driven well which they used, or from wet-weather springs, we can not say.

The following figures give the principal facts concerning typhoid fever in this division:

Brigade and regiment.	Date of first case.	Total number of cases.	Number of recognized cases.	Total deaths.	Deaths from typhoid.	Per cent of deaths among probable cases.	Per cent of deaths among recognized cases.
<i>First Brigade.</i>							
Fourteenth New York ..	May 23	233	95	31	24	10.30	25.26
First Missouri	May 31	216	46	14	11	5.09	23.91
Fifth Maryland	June 25	250	147	18	17	6.80	11.56
<i>Second Brigade.</i>							
Second Nebraska	May 26	167	56	26	22	13.17	39.28
Second New York	June 1	161	46	31	30	18.63	65.21
First District of Columbia.							
<i>Third Brigade.</i>							
Third Tennessee	June 9	123	61	19	12	9.75	19.67
First Vermont	May 26	278	84	26	22	7.91	26.19
Eighth New York	June 24	425	190	23	22	5.17	11.58

Total number of cases of probable typhoid fever in the eight regiments of this division	1,853
Total number of deaths from typhoid in the eight regiments	160
Percentage of deaths among probable cases of typhoid fever	8.63
Total number of cases of recognized typhoid fever in the eight regiments of this division	725
Percentage of deaths among recognized cases of typhoid fever	22.07

Summary of deaths in the First Division of the Third Army Corps.

Brigade and regiment.	Total deaths.	Deaths due to typhoid fever.
<i>First Brigade.</i>		
Fourteenth New York	31	24
First Missouri	14	11
Fifth Maryland	18	17
Total	63	52
<i>Second Brigade.</i>		
Second Nebraska	26	22
Second New York	31	30
First District of Columbia	25	14
Total	84	66
<i>Third Brigade.</i>		
Third Tennessee	19	12
First Vermont	26	22
Eighth New York	23	22
Total	68	56

Total deaths	215
Deaths due to typhoid fever	174
Percentage of deaths from typhoid to total deaths, 80.93.	

CHAPTER V.

TYPHOID FEVER IN THE SECOND DIVISION OF THE THIRD ARMY CORPS.

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SECOND KENTUCKY VOLUNTEER INFANTRY.

First Brigade, Second Division, Third Army Corps.

This regiment was mustered into service at Lexington, Ky., May 22. It left Lexington for Chickamauga Park on May 25 and arrived at the latter place May 26.

The surgeon in charge was Maj. Walter H. Dade.

CONDENSED SICK REPORT FROM MAY 22 TO 31, INCLUSIVE.

Mean strength	982
Diarrhea	7
Intermittent malaria	1
Other diseases	18
Total	26

In the June report, Surgeon Dade makes the following statement:

The cases reported unable for duty are due to vaccination. There is very little sickness from diseases other than those common to camp life. Regulars and recruits are all vaccinated, a small majority taking, owing to the fact that the smallpox scare in Kentucky caused them to seek protection in vaccination several months before enlisting. The proportion of sore arms is small.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,312
Intermittent malaria	22
Acute diarrhea	53
Dysentery	1
Other diseases	68
Total	144

There is no comment offered with the July report.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,388
Intermittent malaria	63
Remittent malaria	47

Acute diarrhea	93
Typhoid fever	17
Dysentery	3
Other diseases	127
Total	350

It appears from this report that typhoid fever appeared for the first time in July. Later we will take up the recognized and suspicious cases of typhoid fever and make an analysis of the same.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,329
Intermittent malaria	92
Remittent malaria	79
Acute diarrhea	121
Dysentery	1
Typhoid fever	30
Continued fever	6
Other diseases	40
Total	369

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,329
Intermittent malaria	36
Remittent malaria	13
Acute diarrhea	41
Typhoid fever	6
Dysentery	1
Other diseases	23
Total	120

The following is a list of the recognized and suspected cases of typhoid fever in this regiment:

- No. 1. Company C: Typhoid fever, June 26; sent to Leiter Hospital July 6. Further disposition not given.
- No. 2. Company D: Intermittent malaria, June 29 to July 16.
- No. 3. Company G: Intermittent malaria, June 29 to July 25.
- No. 4. Company M: Intermittent malaria, June 29; still sick in

hospital July 31. The initial date of this illness was probably earlier than indicated. The same man is recorded as having had malaria June 19 to 25. Most probably he had typhoid fever with the initial date at June 19.

No. 5. Company D: Typhoid fever, June 30; died July 15.

No. 6. Company F: Remittent malaria, July 1 to 26.

No. 7. Company D: Without date or diagnosis; sent to division hospital July 2. Here the disease was diagnosed intermittent malaria, and the patient was returned to duty July 24.

No. 8. Company D: Without date or diagnosis; sent to division hospital July 2. Here the disease was diagnosed diarrhea, and the patient was furloughed July 15.

No. 9. Company D: Intermittent malaria, July 2 to 24.

No. 10. Company F: Without date or diagnosis; sent to division hospital July 3. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 17.

No. 11. Company L: Typhoid fever, July 3; furloughed August 13.

No. 12. Company C: Typhoid fever, July 5; sent to Fort McPherson July 25.

No. 13. Company C: Without date or diagnosis; sent to Leiter Hospital July 6. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 6.

No. 14. Company K: Typhoid fever July 6; furloughed July 27.

No. 15. Company D: Typhoid fever, July 6; sent to Fort McPherson July 25.

No. 16. Company K: Without date or diagnosis; sent to division hospital July 7. Here the disease was diagnosed typhoid fever, and the patient was furloughed July 28.

No. 17. Company B: Typhoid fever, July 7; sent to Fort McPherson July 25.

No. 18. Company D: Without date or diagnosis; sent to division hospital July 8. Here the disease was diagnosed malaria, and the patient was furloughed July 18.

No. 19. Company B: Without date or diagnosis; sent to division hospital July 8. Here the disease was diagnosed typhoid fever, and the patient was furloughed July 31.

No. 20. Company F: Without date or diagnosis; sent to division hospital July 8. Here the disease was diagnosed remittent malaria, and the patient was still sick in hospital July 31.

No. 21. Company D: Intermittent malaria, July 8; furloughed July 29.

No. 22. Company A: Diarrhea, July 9; still sick July 31.

No. 23. Company C: Intermittent malaria, July 10; still sick in hospital July 31.

No. 24. Company E: Without date or diagnosis; sent to division hospital July 10. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 29.

No. 25. Company F: Diarrhea, July 10; furloughed August 1.

No. 26. Company M: Typhoid fever, July 11; died August 9.

No. 27. Company D: Without date or diagnosis; sent to division hospital July 11. Here the disease was diagnosed typhoid fever, and the patient was furloughed July 31.

No. 28. Company H: Diarrhea, July 12; furloughed August 15.

No. 29. Company L: Diarrhea, July 12; still sick in hospital July 31.

No. 30. Company A: Without date or diagnosis; sent to division hospital July 12. Here the disease was diagnosed dysentery, and the patient was furloughed July 24.

No. 31. Company B: Diarrhea, July 12; sent to division hospital August 12. Here the diagnosis was changed to malaria, and the patient was furloughed August 25.

No. 32. Company H: Typhoid fever, July 13; sent to Fort McPherson July 13.

No. 33. Company H: Diarrhea, July 13; returned to duty July 29. There is some doubt whether the "return to duty" means what it says or signifies furlough.

No. 34. Company D: Remittent malaria, July 14; still sick September 30.

No. 35. Company F: Typhoid fever, July 14; sent to Fort McPherson July 25.

No. 36. Company B: Remittent malaria, July 14; still sick September 30.

No. 37. Company L: Without date or diagnosis; sent to division hospital July 14. Here the disease was diagnosed remittent malaria and the patient remained sick September 30.

No. 38. Company F: Without date or diagnosis; sent to division hospital July 14. Here the disease was diagnosed typhoid fever and the patient was transferred to Fort McPherson July 25.

No. 39. Company F: Remittent malaria, July 15; still sick September 30.

No. 40. Company F: Without date or diagnosis; sent to division hospital July 15. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 41. Company D: Typhoid fever, July 15; still sick September 30.

No. 42. Company B: Remittent malaria, July 15; still sick September 30.

No. 43. Company M: Remittent malaria, July 15; still sick September 30.

No. 44. Company F: Diarrhea, July 15; still sick September 30.

No. 45. Company D: Without date or diagnosis; sent to division hospital July 15. Here the disease was diagnosed continued malaria, and the patient was still sick September 30.

No. 46. Company G: Without date or diagnosis; sent to division hospital July 16. Here the disease was diagnosed malaria, and the patient was still sick September 30.

No. 47. Company G: Intermittent malaria, July 16 to August 11.

No. 48. Company C: Intermittent malaria, July 16; still sick September 30.

No. 49. Company F: Remittent malaria, July 16; still sick September 30. This man is recorded as having had malaria from July 3 to 7.

No. 50. Company G: Remittent malaria, July 16; still sick September 30.

No. 51. Company F: Remittent malaria, July 16; still sick September 30.

No. 52. Company B: Remittent malaria, July 18; still sick September 30.

No. 53. Company M: Remittent malaria, July 18; still sick September 30.

No. 54. Company L: Without date or diagnosis; sent to division hospital July 18. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 30.

No. 55. Company E: Without date or diagnosis; sent to division hospital July 19. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 56. Company E: Remittent malaria, July 20; still sick September 30.

No. 57. Band: Without date or diagnosis; sent to division hospital July 20. Here the disease was diagnosed malaria, and the patient was still sick September 30.

No. 58. Company B: Without date or diagnosis; sent to division hospital July 21. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 59. Company E: Typhoid fever, July 21; still sick September 30.

No. 60. Company B: Without date or diagnosis; sent to division hospital July 21. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 61. Company G: Typhoid fever, July 22; still sick September 30.

No. 62. Company K: Typhoid fever, July 22; died in Leiter Hospital July 30.

No. 63. Company M: Typhoid fever, July 22; still sick September 30.

No. 64. Company D: Remittent malaria, July 23; still sick September 30.

No. 65. Company G: Remittent malaria, July 23; still sick September 30.

No. 66. Company M: Without date or diagnosis; sent to division hospital July 23. Here the disease was diagnosed typhoid fever, and the patient was still sick September 30.

No. 67. Company E: Remittent malaria, July 23; still sick September 30.

No. 68. Company C: Remittent malaria, July 23; died in Leiter Hospital August 29. In the hospital this case was diagnosed typhoid fever.

No. 69. Company E: Typhoid fever, July 23; still sick September 30.

No. 70. Company E: Typhoid fever, July 23; still sick September 30.

No. 71. Company G: Remittent malaria, July 24; still sick September 30. This man had diarrhea June 6 to 13.

No. 72. Company B: Without date or diagnosis; sent to division hospital July 24. Here the disease was diagnosed typhoid fever, and the patient was still sick September 30.

No. 73. Company E: Without date or diagnosis; sent to division hospital July 25. Here the disease was diagnosed typhoid fever, and the patient was still sick September 30.

No. 74. Company G: Typhoid fever, July 25; still sick September 30.

No. 75. Company E: Remittent malaria, July 26; still sick September 30.

No. 76. Company B: Remittent malaria, July 26; still sick September 30.

No. 77. Company A: Intermittent malaria, July 26 to August 22.

No. 78. Company A: Without date or diagnosis; sent to division hospital July 28. Here the disease was diagnosed malaria, and the patient was still sick September 30.

No. 79. Company E: Remittent malaria, July 28; still sick September 30.

No. 80. Company F: Remittent malaria, July 28; still sick September 30.

No. 81. Company D: Without date or diagnosis; sent to division hospital July 28. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 82. Company E: Intermittent malaria, July 29; still sick September 30.

No. 83. Company G: Remittent malaria, July 29; still sick September 30.

No. 84. Company I: Remittent malaria, July 29; still sick September 30.

No. 85. Company K: Intermittent malaria, July 29; died in Leiter Hospital August 27. In the hospital this case was diagnosed typhoid fever.

No. 86. Company B: Dysentery, July 29 to August 30.

No. 87. Company E: Without date or diagnosis; sent to division hospital July 30. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 6.

No. 88. Company G: Remittent malaria, July 30; still sick September 30.

No. 89. Company B: Without date or diagnosis; sent to division hospital July 30. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 90. Company A: Without date or diagnosis; sent to division hospital July 30. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 91. Company B: Remittent malaria, July 30; still sick September 30.

No. 92. Company E: Diarrhea, July 30; still sick September 30.

No. 93. Company B: Intermittent malaria, July 31; still sick September 30.

No. 94. Company K: Typhoid fever, July 31; still sick September 30.

No. 95. Company I: Remittent malaria, July 31; still sick September 30.

No. 96. Company G: Intermittent malaria, July 31; still sick September 30.

No. 97. Company A: Remittent malaria, July 31; died in Sternberg Hospital August 17. In the hospital this case was diagnosed typhoid fever.

No. 98. Company C: Intermittent malaria, July 31 to September 30.

No. 99. Company A: Without date or diagnosis; sent to division hospital July 31. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 9.

No. 100. Company C: Remittent malaria, August 1; still sick September 30.

No. 101. Company F: Intermittent malaria, August 2; still sick September 30. In the hospital this case was diagnosed typhoid fever.

No. 102. Company F: Typhoid fever, August 2; died in Sternberg Hospital August 17.

No. 103. Company K: Remittent malaria, August 2; still sick September 30.

No. 104. Company F: Diarrhea, August 2; still sick September 30.

No. 105. Without company, date, or diagnosis; sent to division hospital August 3. Here the disease was diagnosed undetermined fever, and the patient was still sick September 30.

No. 106. Company E: Intermittent malaria, August 3; still sick September 30.

No. 107. Company B: Typhoid fever, August 3; died in Sternberg Hospital September 26.

No. 108. Company H: Remittent malaria, August 3; still sick September 30.

No. 109. Company B: Without date or diagnosis; sent to Sternberg Hospital August 3. Here the disease was diagnosed as continued malaria, and the patient died September 7.

No. 110. Company E: Remittent malaria, August 4; still sick September 30.

No. 111. Company B: Typhoid fever, August 4; still sick September 30.

No. 112. Company F: Typhoid fever, August 4; still sick September 30.

No. 113. Company E: Without date or diagnosis; sent to division hospital August 5. Here the disease was diagnosed continued malaria, and the patient was still sick September 30.

No. 114. Company C: Typhoid fever, August 6; still sick September 30.

No. 115. Company A: Remittent malaria, August 6; still sick September 30.

No. 116. Company A: Continued fever, August 6; still sick September 30. In Sternberg Hospital this case was diagnosed typhoid fever. This man is recorded as having had diarrhea July 31, and the record is left incomplete.

No. 117. Company B: Typhoid fever, August 6; still sick September 30.

No. 118. Company F: Intermittent malaria, August 6; still sick September 30. This man is recorded as having had diarrhea June 25 to 28; diarrhea again July 21, with an incomplete record.

No. 119. Company B: Without date or diagnosis; sent to division hospital August 6. Here the disease was diagnosed continued fever, and the patient was still sick September 30.

No. 120. Company C: Remittent malaria, August 6; still sick September 30.

No. 121. Company A: Without date or diagnosis; sent to division hospital August 6. Here the disease was diagnosed continued fever, and the patient was still sick September 30.

No. 122. Company G: Remittent malaria, August 7; still sick September 30.

No. 123. Company H: Typhoid fever, August 7; still sick September 30.

No. 124. Company G: Remittent malaria, August 7; still sick September 30.

No. 125. Company B: Typhoid fever, August 7; still sick September 30.

No. 126. Company A: Typhoid fever, August 7; died in Sternberg Hospital August 15.

No. 127. Company E: Remittent malaria, August 7; still sick September 30. In the hospital this case was diagnosed typhoid fever.

No. 128. Company C: Typhoid fever, August 7; died in Leiter Hospital August 27.

No. 129. Company G: Typhoid fever, August 8; still sick September 30.

No. 130. Company M: Typhoid fever, August 8; still sick September 30.

No. 131. Company B: Without date or diagnosis; sent to division hospital August 8. Here the disease was diagnosed continued fever, and the patient was still sick September 30.

No. 132. Company H: Without date or diagnosis; sent to division hospital August 8. Here the disease was diagnosed continued fever, and the patient was still sick September 30.

No. 133. Company L: Remittent malaria, August 8; still sick September 30.

No. 134. Company K: Remittent malaria, August 8; still sick September 30.

No. 135. Company K: Without date or diagnosis; sent to division hospital August 9. Here the disease was diagnosed continued fever, and the patient was still sick September 30.

No. 136. Company K: Intermittent malaria, August 9; still sick September 30.

No. 137. Company K: Intermittent malaria, August 9; still sick September 30.

No. 138. Company C: Intermittent malaria, August 9; still sick September 30.

No. 139. Company K: Diarrhea, August 9; still sick September 30. In the hospital this diagnosis was changed to continued malaria.

No. 140. Company B: Remittent malaria, August 10; still sick September 30.

No. 141. Company G: Without date or diagnosis; sent to division hospital August 10. Here the disease was diagnosed continued fever, and the patient was still sick September 30.

No. 142. Company G: Typhoid fever, August 10; still sick September 30.

No. 143. Company G: Intermittent malaria, August 10; still sick September 30.

No. 144. Company A: Remittent malaria, August 11; still sick September 30.

No. 145. Company I: Remittent malaria, August 11; still sick September 30.

No. 146. Company L: Without date or diagnosis; sent to division hospital August 11. Here the disease was diagnosed malaria, and the patient was furloughed from hospital October 6.

No. 147. Company G: Intermittent malaria, August 11; still sick September 30.

No. 148. Company K: Intermittent malaria, August 11; still sick September 30. In the hospital this case was diagnosed typhoid fever.

No. 149. Company K: Without date or diagnosis; sent to division hospital August 11. Here the disease was diagnosed continued fever, and the patient was still sick September 30.

No. 150. Company G: Remittent malaria, August 12; still sick September 30.

No. 151. Company M: Without date or diagnosis; sent to division hospital August 12. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 16.

No. 152. Company H: Remittent malaria, August 12; still sick September 30.

No. 153. Company G: Remittent malaria, August 12; still sick September 30.

No. 154. Company M: Without date or diagnosis; sent to division

hospital August 12. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 155. Company A: Remittent malaria, August 12; still sick September 30.

No. 156. Company K: Typhoid fever, August 12; still sick September 30.

No. 157. Company D: Intermittent malaria, August 12; still sick September 30.

No. 158. Company A: Remittent malaria, August 13; still sick September 30.

No. 159. Company I: Without date or diagnosis; sent to division hospital August 13. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 160. Company I: Remittent malaria, August 13; still sick September 30. In the hospital this diagnosis was changed to undetermined fever.

No. 161. Company B: Typhoid fever, August 13; still sick in Sternberg Hospital September 30.

No. 162. Company E: Intermittent malaria, August 13; still sick September 30.

No. 163. Company M: Intermittent malaria, August 13; still sick September 30.

No. 164. Company D: Without date or diagnosis; sent to division hospital August 13. Here the disease was diagnosed typhoid fever, and the patient was still sick September 30.

No. 165. Company E: Remittent malaria, August 13; still sick September 30. This man is recorded as having had malaria July 21 to 27.

No. 166. Company I: Typhoid fever, August 14; still sick September 30.

No. 167. Company A: Without date or diagnosis; sent to Sternberg Hospital August 14. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 22.

No. 168. Company B: Intermittent malaria, August 14; still sick September 30.

No. 169. Company B: Diarrhea, August 14; still sick September 30. This man is recorded as having had malaria from July 18 to 24.

No. 170. Without company, date, or diagnosis; sent to division hospital August 14. Here the disease was diagnosed continued malaria, and the patient was still sick September 30.

No. 171. Company C: Intermittent malaria, August 14; still sick September 30.

No. 172. Company E: Remittent malaria, August 15; still sick September 30.

No. 173. Company B: Remittent malaria, August 15; still sick September 30.

No. 174. Company I: Diarrhea, August 16; still sick September 30.

No. 175. Company B: Remittent malaria, August 16; still sick September 30.

No. 176. Company G: Diarrhea, August 16; still sick September 30.

No. 177. Company L: Undetermined fever, August 16; still sick September 30.

No. 178. Company K: Typhoid fever, August 16; still sick September 30.

No. 179. Company M: Remittent malaria, August 17; still sick September 30.

No. 180. Company M: Diarrhea, August 17; still sick September 30.

No. 181. Company M: Intermittent malaria, August 17; still sick September 30.

No. 182. Company A: Diarrhea, August 18; still sick September 30.

No. 183. Company K: Remittent malaria, August 18; still sick September 30.

No. 184. Company A: Intermittent malaria, August 18; still sick September 30.

No. 185. Company A: Intermittent malaria, August 18; still sick September 30.

No. 186. Company B: Intermittent malaria, August 19; still sick September 30.

No. 187. Company F: Intermittent malaria, August 20; still sick September 30.

No. 188. Company K: Intermittent malaria, August 20; still sick September 30.

No. 189. Company B: Remittent malaria, August 20; still sick September 30.

No. 190. Company B: Diarrhea, August 20; still sick September 30.

No. 191. Company E: Intermittent malaria, August 20; still sick September 30.

No. 192. Company G: Remittent malaria, August 20; still sick September 30.

No. 193. Company I: Remittent malaria, August 20; still sick September 30.

No. 194. Company C: Remittent malaria, August 20; still sick September 30.

No. 195. Company M: Diarrhea, August 21; still sick September 30.

No. 196. Company A: Intermittent malaria, August 21; still sick September 30.

No. 197. Company K: Intermittent malaria, August 21; still sick September 30.

No. 198. Company M: Diarrhea, August 22; still sick September 30.

No. 199. Company B: Intermittent malaria, August 22; still sick September 30.

No. 200. Company M: Typhoid fever, August 22; still sick September 30.

No. 201. Company H: Remittent malaria, August 22; still sick September 30. This man is recorded as having had malaria from June 29 to July 5.

No. 202. Company A: Diarrhea, August 22; still sick September 30.

No. 203. Company K: Typhoid fever, August 23; still sick September 30.

No. 204. Company K: Intermittent malaria, August 23; still sick September 30.

No. 205. Company A: Intermittent malaria, August 23; still sick September 30.

No. 206. Company C: Intermittent malaria, August 23; still sick September 30.

No. 207. Company A: Without date or diagnosis; sent to division hospital August 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 25.

No. 208. Company A: Intermittent malaria, August 23; still sick September 30.

No. 209. Company H: Typhoid fever, August 24; still sick September 30.

No. 210. Company E: Typhoid fever, August 24; still sick September 30.

No. 211. Company M: Remittent malaria, August 24; still sick September 30.

No. 212. Company G: Typhoid fever, August 24; still sick September 30.

No. 213. Company F: Remittent malaria, August 25; still sick September 30.

No. 214. Company I: Remittent malaria, August 25; still sick September 30.

No. 215. Company K: Typhoid fever, August 25; still sick September 30.

No. 216. Company K: Intermittent malaria, August 25; still sick September 30.

No. 217. Company G: Intermittent malaria, August 25; still sick September 30.

No. 218. Company G: Remittent malaria, August 25; still sick September 30.

No. 219. Company G: Intermittent malaria, August 25; still sick September 30.

No. 220. Band: Typhoid fever, August 25; still sick September 30.

No. 221. Company I: Diarrhea, August 25; still sick September 30.

No. 222. Company E: Typhoid fever, August 25; still sick September 30.

No. 223. Company I: Intermittent malaria, August 25; still sick September 30.

No. 224. Company C: Typhoid fever, August 25; still sick September 30.

No. 225. Company M: Remittent malaria, August 25; still sick September 30.

No. 226. Company H: Remittent malaria, August 25; still sick September 30. This man is recorded as having had malaria August 5 to 13.

No. 227. Company C: Remittent malaria, August 26; still sick September 30.

No. 228. Company B: Without date or diagnosis; sent to division hospital August 26. Here the disease was diagnosed undetermined fever, and the patient was still sick September 30.

No. 229. Company I: Remittent malaria, August 26; still sick September 30.

No. 230. Company K: Remittent malaria, August 26; still sick September 30.

No. 231. Company M: Without date or diagnosis; sent to division hospital August 26. Here the disease was diagnosed malaria, and the patient was still sick September 30.

No. 232. Company E: Without date or diagnosis; sent to division hospital August 26. Here the disease was diagnosed malaria, and the patient was still sick September 30.

No. 233. Company G: Remittent malaria, August 26; still sick September 30.

No. 234. Company G: Without date or diagnosis; sent to division hospital August 26. Here the disease was recorded as undetermined fever, and the patient was still sick September 30.

No. 235. Company F: Diarrhea, August 26; still sick September 30.

No. 236. Company G: Intermittent malaria, August 26; still sick September 30.

No. 237. Company I: Remittent malaria, August 27; still sick September 30.

No. 238. Company I: Intermittent malaria, August 27; still sick September 30.

No. 239. Company M: Intermittent malaria, August 27; still sick September 30.

No. 240. Company C: Typhoid fever, August 27; died September 5.

No. 241. Company L: Intermittent malaria, August 28; still sick September 30.

No. 242. Company K: Diarrhea, August 28; still sick September 30.

No. 243. Company E: Intermittent malaria, August 28; still sick September 30.

No. 244. Company E: Typhoid fever, August 29; still sick September 30.

No. 245. Company F: Without date or diagnosis; sent to Sternberg Hospital August 30. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 3.

No. 246. Company M: Typhoid fever, August 30; still sick September 30.

No. 247. Company H: Intermittent malaria, August 30; still sick September 30.

No. 248. Company B: Without date or diagnosis; sent to Sternberg Hospital August 30. Here the disease was diagnosed typhoid fever, and the patient died September 6.

No. 249. Company E: Typhoid fever, August 31; still sick September 30.

No. 250. Company G: Typhoid fever, August 31; still sick September 30.

No. 251. Company H: Typhoid fever, August 31; still sick September 30.

No. 252. Company I: Typhoid fever, August 31; furloughed from Leiter Hospital October 11.

No. 253. Company G: Typhoid fever, August 31; still sick September 30.

No. 254. Company B: Without date or diagnosis; sent to Sternberg Hospital September 1. Here the disease was diagnosed continued malaria, and the patient was furloughed September 17.

No. 255. Company M: Typhoid fever, September 3; still sick September 30.

No. 256. Company G: Without date or diagnosis; sent to Sternberg Hospital September 3. Here the disease was diagnosed continued malaria, and the patient was furloughed September 17.

No. 257. Company A: Remittent malaria, September 3 to 18.

No. 258. Company G: Remittent malaria, September 3 to 18.

The records leave us in doubt whether these patients were returned to duty or furloughed.

No. 259. Company M: Remittent malaria, September 3; still sick September 30.

No. 260. Company G: Intermittent malaria, September 3; still sick September 30.

No. 261. Company M: Remittent malaria, September 3; still sick September 30.

No. 262. Company B: Remittent malaria, September 3; still sick September 30.

No. 263. Company K: Remittent malaria, September 4; still sick September 30.

No. 264. Company I: Intermittent malaria, September 4; still sick September 30.

No. 265. Company E: Remittent malaria, September 4; still sick September 30.

No. 266. Company I: Remittent malaria, September 4; still sick September 30.

No. 267. Company K: Intermittent malaria, September 4; still sick September 30.

No. 268. Company H: Without date or diagnosis; sent to division hospital September 6. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 29.

No. 269. Company B: Typhoid fever, September 7; still sick September 30.

No. 270. Company I: Dysentery, September 7; still sick September 30.

No. 271. Company B: Without date or diagnosis; sent to Sternberg Hospital September 7. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 23.

No. 272. Company C: Remittent malaria, September 10; furloughed from Sternberg Hospital October 5.

No. 273. Company A: Typhoid fever, September 10; still sick September 30.

No. 274. Company H: Without date or diagnosis; sent to Leiter Hospital September 11. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 17.

No. 275. Company L: Without date or diagnosis; sent to Sternberg Hospital September 12. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 21.

No. 276. Company G: Without date or diagnosis; sent to Sternberg Hospital September 12. Here the disease was diagnosed as remittent malaria, and the patient was furloughed September 27.

No. 277. Company E: Without date or diagnosis; sent to Sternberg Hospital September 12. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 26.

No. 278. Company A: Without date or diagnosis; sent to hospital September 13. Here the disease was diagnosed remittent malaria, and the patient was still sick September 30.

No. 279. Company A: Without date or diagnosis; sent to hospital September 13. Here the disease was diagnosed typhoid fever, and the patient was transferred to Fort Thomas November 2.

No. 280. Company H: Remittent malaria September 14; sent to division hospital September 14; returned to sick quarters October

12, and returned to division hospital October 21. Here the disease was diagnosed typhoid fever, and the patient was transferred to Fort Thomas November 5.

No. 281. Band; Without date or diagnosis; sent to hospital September 14. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 24.

No. 282. Company E: Without date or diagnosis; sent to division hospital September 14. Here the disease was diagnosed typhoid fever, and the patient died September 23.

No. 283. Company G: Without date or diagnosis; sent to hospital September 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 26.

No. 284. Company I: Without date or diagnosis; sent to division hospital September 16. Here the disease was diagnosed remittent malaria, and the patient was transferred to Fort Thomas November 2.

No. 285. Company B: Without date or diagnosis; sent to hospital September 16. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 3.

No. 286. Company M: Without date or diagnosis; sent to division hospital without date. Here the disease was diagnosed typhoid fever, and the further disposition is not given.

SUMMARY.

Assembled at Lexington, Ky., during April and May, 1898.

Mustered into United States service May 22, 1898.

Arrived at Chickamauga Park, Ga., May 26, 1898.

Strength on arrival, 982.

Date of first case of probable typhoid fever, June 26, 1898.

Date of first case of recognized typhoid fever, June 26, 1898.

Left Chickamauga Park, Ga., September 12, 1898.

Strength on departure, 1,332.

Number of cases of probable typhoid fever developed at Chickamauga	277
Number of cases of probable typhoid fever developed after leaving Chickamauga	9

Total number cases of probable typhoid fever developed in the Second Kentucky Volunteer Infantry from May to September, 1898	286
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These cases were diagnosed as follows:

Typhoid fever	87
Malaria	172
Diarrhea	20
Undetermined fever	5
Dysentery	2
Total	286

The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Boedecker, A. J.	Pvt., G.	1898. Aug. 8	Newport, Ky.	(Typhoid); malarial fever and general debility.
Bright, John M.	Pvt., D.	July 28	Lexington, Ky.	Typhoid.
Burchell, R. R.	Mus., F.	May 27	do	Pneumonia.
Cheatham, J. D.	Pvt., L.	Oct. 17	Bryantsville, Ky.	Typhoid.
Childers, Alma J.	Artif., M.	Aug. 11	Fort McPherson, Ga.	Do.
Eldridge, Arch.	Pvt., G.	Sept. 30	Camp Hamilton, Ky.	Do.
Englebert, Frank.	Pvt., E.	Sept. 23	do	Do.
Finck, Charles.	Pvt., B.	Sept. 6	Chickamauga, Ga.	Do.
Flood, Chesley J.	Pvt., C.	Sept. 4	Camp Thomas, Ga.	Do.
Gorman, John T.	Pvt., F.	Sept. 12	Flemingsburg, Ky.	Do.
Harlan, Wellington.	Pvt., A.	Oct. 12	Harrodsburg, Ky.	Do.
Holmes, Jesse D.	Corpl., E.	Aug. 15	Frankfort, Ky.	Do.
Houp, Calvin.	Pvt., M.	Aug. 11	Pleasant Hill, Ky.	Do.
Huesman, W.	Pvt., K.	July 30	Camp Thomas, Ga.	Do.

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Jenkins, Paul	Pvt., C.	1898. Sept. 26	Cynthiana, Ky	Appendicitis.
Johnston, James R	Pvt., D.	July 15	Camp Thomas, Ga.....	Typhoid.
Knarr, Louis A.....	Pvt., G.	Aug. 26	Newport, Ky	Do.
Mahone, Samuel	Pvt., C.	Aug. 29	Leiter Hospital, Ga.....	Do.
Martin, Oliver.....	Pvt., B.	Sept. 26	Sternberg Hospital.....	Do.
Otis, Joseph	Pvt., F.	Aug. 16	Camp Thomas, Ga.....	Do.
Parks, Clarence	Pvt., L.	Aug. 21	Lancaster, Ky	Do.
Patterson, Russell.....	Pvt., F.	Oct. 11	Lexington, Ky	Do.
Peaveley, W.	Pvt., K.	Aug. 27	Leiter Hospital, Ga.....	Do.
Reed, Grafton W.....	1stsgt. A.	Aug. 19	Chickamauga, Ga.....	Do.
Ronan, W. L.	Pvt., A.	Aug. 17	Camp Thomas, Ga.....	Do.
Smith, Paul P.....	Pvt., I.	Aug. 7	Chickamauga, Ga.....	Do.
Shryack, Hugh E.....	Pvt., D.	Aug. 22	Lawrenceburg, Ky	(Typhoid); hemorrhage of bowels.
Tandy, Jessie.....	Pvt., F.	July 25	Fort McPherson, Ga.....	Typhoid.
Turk, Chas.....	Pvt., B.	Sept. 7	Sternberg Hospital.....	Do.
Woosley, Woodie	Pvt., C.	Aug. 29	Chickamauga	Do.

Total deaths..... 30

Deaths from typhoid fever..... 28

Percentage of deaths among probable cases of typhoid fever (286), 9.79.

Percentage of deaths among recognized cases of typhoid fever (87), 32.18.

We inspected this regiment at Chickamauga September 10, 1898. The command was located in the woods. Fecal matter was deposited around trees, some of which were not more than 50 feet from mess tents. This fecal matter was covered with swarms of flies. Fecal matter was found deposited on the ground all through the woods and a vile odor was perceptible.

The following information is condensed from testimony given to us at the time of the inspection of this camp by Capt. Charles Farmer, assistant surgeon of this regiment. On leaving Lexington, Ky., this regiment did not bring any sick with it to Chickamauga. Upon reaching Chickamauga it encamped at the place now (September 10, 1898) occupied. Some of the tents have been moved a little, but the regiment occupies the same site. On reaching Chickamauga, drinking water was first obtained from Crawfish Spring; later, the pipes carrying Chickamauga Creek water were laid. The men were ordered not to drink from the hydrants at any time, but the probabilities are that they did drink this water. The regiment did not use boiled water at any time. Milk was purchased from venders who went through the camp, and Doctor Farmer was unable to give us any information concerning the character and source of this milk.

Captain Winn, also assistant surgeon of the Second Kentucky Volunteer Infantry, stated to us that when the regiment left Lexington, Ky., one man remained sick with typhoid fever and died later. Captain Winn testified that an attempt had been made to use filters, but they soon clogged up and were broken. When asked his opinion concerning the origin and spread of typhoid fever in the regiment, Captain Winn made the following statement:

I have believed that the disease has been caused by the water or milk which the men have been in the habit of drinking. The camp has been filled with hucksters, who have sold lemonade and milk diluted with water which may have come from some infected source.

NINTH NEW YORK VOLUNTEER INFANTRY.

First Brigade, Second Division, Third Army Corps.

The first report for this regiment covers the period from May 26 to May 31, 1898.

CONDENSED SICK REPORT FOR MAY.

Mean strength	1,025
Diarrhea.....	17
Dysentery	1
Other diseases.....	5
Total	23

The June report is signed by Capt. A. W. Preston, who makes the following statement:

The prevailing cases during the earlier part of the month were attacks of gastritis and acute diarrhea caused by climatic conditions, supplemented by habits of men and improper preparation of their food; attention was given to the direct causes, but the amount of gastritis and diarrhea has been rather on the increase. Instructions, not orders, have been given the men repeatedly about their diet and mode of living, but these instructions in many cases are not followed. The latter part of the month fevers appeared, some distinctly malarial, others unclassified at the time; on removal to division hospital some cases proved to be typhoid. A large number of the men not relieved from duty suffer from loss of appetite, mild diarrhea, and general weakness. The diarrheas have not been checked, but the bowels have been flushed out and available dietetic measures carried out. This treatment has not been possible in many cases. The general health is good, and the tone of the men is good with few exceptions. The sanitary conditions are better than they were at last report, but rules are carried out with difficulty.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,129
Dysentery	1
Diarrhea.....	148
Gastro-enteritis	7
Intestinal colic	17
Gastritis	10
Indigestion	5
Intermittent malaria.....	18
Remittent malaria.....	3
Typhoid fever.....	5
Other diseases.....	68
Total	282

There is no comment made on the July report.

CONDENSED SICK REPORT FOR JULY.

Mean strength not given.	
Diarrhea.....	100
Intermittent malaria.....	158
Gastro-enteritis	12
Typhoid fever.....	33
Intestinal colic	6
Malarial enteritis.....	1
Remittent malaria	15
Indigestion	3
Dysentery	1
Other diseases.....	105
Total	434

In the August report Lieutenant Hommedieu makes the following statement:

The prevailing diseases are acute diarrhea, myalgia, intermittent and remittent fevers.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,148
Diarrhea	148
Dysentery	3
Intermittent malaria	105
Remittent malaria	41
Typhoid fever	24
Undetermined fever	118
Gastro-enteritis	12
Intestinal colic	4
Other diseases	102
Total	557

There is no report from this regiment after August.

The following list includes the cases of recognized and probable typhoid fever in this regiment during its stay at Chickamauga Park:

- No. 1. Company E: Diarrhea, June 10 to 20.
- No. 2. Company C: Enteric fever, June 13; still sick August 31.
- No. 3. Company A: Enteric fever, June 15; still sick August 31.
- No. 4. Company L: Enteric fever, June 18; still sick August 31. In the hospital this case was diagnosed typhoid fever.
- No. 5. Company A: Enteric fever, June 18; died at Fort McPherson August 19.
- No. 6. Company E: Tertian malaria, June 24; still sick August 31.
- No. 7. Company K: Tertian malaria, June 24; died July 22.
- No. 8. Company F: Typhoid fever, June 24; still sick August 31.
- No. 9. Company L: Intermittent malaria, June 25 to July 25.
- No. 10. Company A: Tertian malaria, June 26; still sick August 31. In Leiter Hospital this case was diagnosed typhoid fever.
- No. 11. Company A: Quotidian malaria, June 27 to July 7.
- No. 12. Company H: Typhoid fever, June 27; still sick August 31.
- No. 13. Company A: Tertian malaria, June 28; still sick August 31.
- No. 14. Company L: Intermittent malaria, June 28; still sick August 31.
- No. 15. Company D: Tertian malaria, June 29; still sick August 31. At Fort McPherson this case was diagnosed typhoid fever.
- No. 16. Company I: Typhoid fever, June 29; still sick August 31.
- No. 17. Company I: Tertian malaria, June 29; still sick August 31.
- No. 18. Company F: Typhoid fever, June 29 to July 25.
- No. 19. Company E: Intermittent malaria, June 29 to July 28.
- No. 20. Company D: Intermittent malaria, July 1 to 15.
- No. 21. Company G: Typhoid fever, July 2; still sick August 31.
- No. 22. Company C: Intermittent malaria, July 2 to 28.
- No. 23. Company H: Typhoid fever, July 3; still sick August 31.
- No. 24. Company I: Typhoid fever, July 3; furloughed from Leiter Hospital October 22.
- No. 25. Company I: Intermittent malaria, July 4 to 16.
- No. 26. No company: Remittent malaria, July 4; still sick August 31.
- No. 27. Company L: Typhoid fever, July 4; still sick August 31.
- No. 28. Company L: Remittent malaria, July 5; still sick August 31.
- No. 29. Company K: Typhoid fever, July 5; died in Leiter Hospital August 5.
- No. 30. Company L: Diarrhea, July 6 to August 9.
- No. 31. Company L: Intermittent malaria, July 6 to 27.
- No. 32. Company L: Intermittent malaria, July 6; still sick August 31.
- No. 33. Company L: Intermittent malaria, July 6 to 19.
- No. 34. Company M: Malaria, July 6; still sick August 31.

- No. 35. Company C: Typhoid fever, July 7; still sick August 31.
- No. 36. Company I: Intermittent malaria, July 7; still sick August 31.
- No. 37. Company H: Intermittent malaria, July 7 to 24.
- No. 38. Company K: Continued fever, July 8; still sick August 31.
- No. 39. Company I: Remittent malaria, July 8 to August 1.
- No. 40. Company G: Remittent malaria, July 9 to 24.
- No. 41. Company D: Gastro-enteritis, July 9; still sick August 31. In the division hospital this case was diagnosed typhoid fever.
- No. 42. Company A: Typhoid fever, July 9; still sick August 31.
- No. 43. Company C: Intermittent malaria, July 9 to August 9. In the hospital this case was diagnosed typhoid fever.
- No. 44. Company E: Malaria, July 9 to 29.
- No. 45. Company C: Typhoid fever, July 9; died in hospital October 17.
- No. 46. Company F: Typhoid fever, July 10; still sick August 31.
- No. 47. Company C: Intermittent malaria, July 10; still sick August 31. In the hospital this case was diagnosed typhoid fever.
- No. 48. Company F: Typhoid fever, July 11; still sick August 31.
- No. 49. Company G: Remittent malaria, July 11; still sick August 31.
- No. 50. Company G: Continued fever, July 11 to August 2.
- No. 51. Company L: Malaria, July 12; still sick August 31.
- No. 52. Company F: Intermittent malaria, July 12 to August 3.
- No. 53. Company I: Remittent malaria, July 13; still sick August 31.
- No. 54. Company I: Intermittent malaria, July 13; still sick August 31.
- No. 55. No company: Intermittent malaria, July 14; still sick August 31.
- No. 56. Company A: Remittent malaria, July 14 to August 16.
- No. 57. Company G: Typhoid fever, July 14; still sick August 31.
- No. 58. Company D: Typhoid fever, July 14 to August 9.
- No. 59. Company D: Typhoid fever, July 14; still sick August 31.
- No. 60. Company F: Remittent malaria, July 14; still sick August 31.
- No. 61. Company D: Intermittent malaria, July 14; still sick August 31.
- No. 62. Company B: Remittent malaria, July 14; still sick August 31.
- No. 63. Company C: Remittent malaria, July 15 to 29.
- No. 64. Company F: Typhoid fever, July 15; still sick August 31.
- No. 65. Company F: Malaria, July 15 to August 9.
- No. 66. Company A: Diarrhea, July 15 to August 4.
- No. 67. Company H: Typhoid fever, July 16; still sick August 31.
- No. 68. Company B: Intermittent malaria, July 16 to August 14. In the division hospital this case was diagnosed typhoid fever.
- No. 69. Company L: Typhoid fever, July 16; still sick August 31.
- No. 70. Company M: Diarrhea, July 18; still sick August 31. In the hospital this case was diagnosed typhoid fever.
- No. 71. Company C: Typhoid fever, July 18; still sick August 31. This man is recorded as having had diarrhea June 15 to 20.
- No. 72. Company H: Intermittent malaria, July 18; still sick August 31.
- No. 73. Company L: Remittent malaria, July 18; still sick August 31.
- No. 74. Company G: Remittent malaria, July 18; still sick August 31. In the hospital this case was diagnosed typhoid fever.
- No. 75. Company K: Continued fever, July 19 to August 19.
- No. 76. Company F: Typhoid fever, July 19 to August 31.
- No. 77. Company I: Typhoid fever, July 19; still sick August 31.
- No. 78. Company B: Intermittent malaria, July 20 to August 14. In the hospital this case was diagnosed typhoid fever.
- No. 79. Company A: Typhoid fever, July 20; still sick August 31.
- No. 80. Company H: Typhoid fever, July 21; died in hospital August 17.
- No. 81. Company E: Typhoid fever, July 21; still sick August 31.
- No. 82. Company F: Intermittent malaria, July 21 to August 16.
- No. 83. Company F: Typhoid fever, July 21; still sick August 31.

No. 84. Company M: Intermittent malaria, July 21; still sick August 31.

No. 85. Company E: Typhoid fever, July 23; still sick August 31.

No. 86. Company K: Intermittent malaria, July 23; still sick August 31.

No. 87. Company C: Without date or diagnosis; sent to Leiter Hospital July 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 14.

No. 88. Company G: Diarrhea, July 24 to August 21.

No. 89. Company A: Typhoid fever, July 24; still sick August 31.

No. 90. Company L: Typhoid fever, July 24; died in hospital August 2. In the hospital this case was diagnosed malaria.

No. 91. Company E: Typhoid fever, July 24; died in hospital August 2.

No. 92. Company K: Intermittent malaria, July 25; still sick August 31.

No. 93. Company C: Typhoid fever, July 26; still sick August 31.

No. 94. Company C: Intermittent malaria, July 26; still sick August 31.

No. 95. Company C: Diarrhea, July 26; still sick August 31. In the hospital this case was diagnosed typhoid fever.

No. 96. Company I: Undetermined fever, July 26; still sick August 31.

No. 97. Company I: Undetermined fever, July 27; still sick August 31. In the hospital this case was diagnosed typhoid fever.

No. 98. Company M: Remittent malaria, July 28; still sick August 31.

No. 99. Company E: Undetermined fever, July 28 to August 18.

No. 100. Company E: Continued fever, July 28; died in hospital September 1. In the hospital this case was diagnosed typhoid fever.

No. 101. Company K: Diarrhea, July 29; still sick August 31.

No. 102. Company D: Undetermined fever, July 30; still sick August 31.

No. 103. Company C: Intermittent malaria, July 30; still sick August 31.

No. 104. Company D: Undetermined fever, July 30 to August 30.

No. 105. Company A: Diarrhea, July 30; still sick August 31.

No. 106. Company D: Diarrhea, July 30; still sick August 31.

No. 107. Company I: Intermittent malaria, July 30; still sick August 31. In the hospital this case was diagnosed typhoid fever.

No. 108. Company C: Intermittent malaria, July 30; still sick August 31. In the hospital this case was diagnosed typhoid fever.

No. 109. Company G: Undetermined fever, July 30; still sick August 31.

No. 110. Company D: Remittent malaria, July 30 to August 26.

No. 111. Company I: Remittent malaria, July 30; still sick August 31.

No. 112. Company A: Continued fever, July 30; still sick August 31.

No. 113. Company C: Undetermined fever, July 30; still sick August 31.

No. 114. Company F: Typhoid fever, July 31 to September 14.

No. 115. Company F: Typhoid fever, July 31; furloughed August 8. This man is recorded as having been returned to duty August 8; this must be a mistake.

No. 116. Company B: Intermittent malaria, August 1; still sick August 31.

No. 117. Company E: Typhoid fever, August 1; still sick August 31.

No. 118. Company C: Intermittent malaria, August 1; still sick August 31.

No. 119. Company F: Intermittent malaria, August 1; furloughed from division hospital August 27.

No. 120. Company C: Typhoid fever, August 1; furloughed from division hospital August 22.

No. 121. Company G: Continued fever, August 1; still sick in division hospital August 31.

No. 122. Company A: Undetermined fever, August 1; died in division hospital August 24.

No. 123. Company I: Intermittent malaria, August 1; furloughed from division hospital August 10.

No. 124. Company C: Intermittent malaria, August 1; furloughed from division hospital August 25.

No. 125. Company C: Undetermined fever, August 2; furloughed from division hospital August 22.

No. 126. Company K: Undetermined fever, August 2; died in division hospital September 3. In the hospital this case was diagnosed typhoid fever.

No. 127. Company C: Undetermined fever, August 3; furloughed from division hospital August 27.

No. 128. Company I: Remittent malaria, August 3; furloughed from division hospital August 13.

No. 129. Company A: Continued fever, August 3; furloughed from division hospital August 23.

No. 130. Company M: Intermittent malaria, August 3; furloughed from division hospital August 22.

No. 131. Company C: Undetermined fever, August 3; still sick August 31.

No. 132. Company K: Remittent malaria, August 3; still sick August 31.

No. 133. Company C: Undetermined fever, August 3; furloughed from division hospital August 22.

No. 134. Company H: Typhoid fever, August 3; furloughed from division hospital September 16.

No. 135. Company K: Undetermined fever, August 4; furloughed from division hospital August 17.

No. 136. Company C: Undetermined fever, August 4; furloughed from division hospital August 20.

No. 137. Company A: Continued malaria, August 4; furloughed from Sternberg Hospital September 7.

No. 138. Company K: Undetermined fever, August 4; furloughed from division hospital August 18.

No. 139. Company C: Undetermined fever, August 4; furloughed from division hospital August 28.

No. 140. Company G: Undetermined fever, August 4; furloughed from division hospital August 20.

No. 141. Company B: Undetermined fever, August 4; furloughed from division hospital August 18.

No. 142. Company C: Malarial fever, August 4; furloughed from division hospital August 22.

No. 143. Company L: Undetermined fever, August 4; furloughed from division hospital August 14.

No. 144. Company E: Continued fever, August 4; furloughed from division hospital August 23.

No. 145. Company E: Continued fever, August 5; still sick in hospital August 31.

No. 146. Company C: Continued fever, August 5; furloughed from division hospital August 22.

No. 147. Company C: Intermittent malaria, August 5; furloughed from division hospital August 19.

No. 148. Company D: Undetermined fever, August 5; furloughed from division hospital August 22.

No. 149. Company B: Typhoid fever, August 5; furloughed from division hospital August 18.

No. 150. Company H: Undetermined fever, August 6; furloughed from division hospital August 22.

No. 151. Company L: Intermittent malaria, August 6; furloughed from division hospital August 17.

No. 152. Company K: Undetermined fever, August 6; furloughed from division hospital August 18.

No. 153. Company K: Diarrhea, August 6; furloughed from division hospital August 22. In the hospital this case was diagnosed continued fever.

No. 154. Company K: Undetermined fever, August 6; furloughed from division hospital August 22.

No. 155. Company H: Undetermined fever, August 6; furloughed from division hospital August 21.

No. 156. Company B: Typhoid fever, August 6; died in division hospital August 22.

No. 157. Company B: Typhoid fever, August 6; furloughed August 27. In the hospital this case was diagnosed continued fever.

No. 158. Company C: Undetermined fever, August 7; furloughed from Leiter Hospital August 31. In division hospital this case was diagnosed continued fever; in Leiter Hospital it was diagnosed typhoid fever. We have, therefore, three diagnoses—a regimental diagnosis of undetermined fever, a diagnosis in division hospital of continued fever, and a diagnosis in Leiter Hospital of typhoid fever.

No. 159. Company B: Malaria, August 7; furloughed from hospital September 27.

No. 160. Company C: Typhoid fever, August 7; died in Leiter Hospital August 26.

No. 161. Company E: Typhoid fever, August 7; still sick in division hospital August 31.

No. 162. Company B: Continued fever, August 7; died in Sternberg Hospital September 7.

No. 163. Company C: Undetermined fever, August 7; furloughed from division hospital August 12.

No. 164. Company C: Undetermined fever, August 7; still sick in Sternberg Hospital September 30.

No. 165. Company G: Intermittent malaria, August 7; furloughed from division hospital August 22.

No. 166. Company L: Continued fever, August 7; still sick August 31.

No. 167. Company H: Continued fever, August 7; still sick August 31.

No. 168. Company B: Continued fever, August 7; furloughed from division hospital August 18.

No. 169. Company D: Undetermined fever, August 7; still sick in division hospital August 31.

No. 170. Company C: Undetermined fever, August 7; furloughed from division hospital August 23.

No. 171. Company E: Intermittent malaria, August 7; still sick in division hospital August 31.

No. 172. Company K: Intermittent malaria, August 7; furloughed from division hospital August 18.

No. 173. Company C: Undetermined fever, August 7; furloughed from division hospital August 26.

No. 174. Company not given: Typhoid fever, August 7; furloughed from hospital August 23.

No. 175. Company F: Intermittent malaria, August 7; furloughed from division hospital September 10. In the hospital this case was diagnosed typhoid fever.

No. 176. Company E: Continued fever, August 7; furloughed from division hospital August 14.

No. 177. Company K: Intermittent malaria, August 8; furloughed August 21.

No. 178. Company L: Typhoid fever, August 8; still sick in Sternberg Hospital August 31.

No. 179. Company A: Diarrhea, August 8 to 30.

No. 180. Company H: Undetermined fever, August 8; furloughed from Leiter Hospital September 14. In Leiter Hospital this case was diagnosed typhoid fever.

No. 181. Company C: Typhoid fever, August 8 to September 14.

No. 182. Company G: Typhoid fever, August 8; furloughed August 26.

No. 183. Company L: Undetermined fever, August 8; furloughed August 26.

No. 184. Company A: Intermittent malaria, August 8; furloughed from division hospital August 21.

No. 185. Company I: Continued fever, August 8; furloughed from division hospital August 17.

No. 186. Company C: Remittent malaria, August 9; still sick in division hospital August 31.

No. 187. Company I: Diarrhea, August 9; furloughed from divi-

sion hospital August 22. In the hospital this case was diagnosed continued fever.

No. 188. Company C: Undetermined fever, August 9; furloughed from division hospital August 23.

No. 189. Company C: Dysentery, August 10; furloughed from division hospital August 21. In the hospital this case was diagnosed diarrhea.

No. 190. Company B: Typhoid fever, August 10; furloughed from division hospital September 11.

No. 191. Company G: Remittent malaria, August 10; furloughed from Leiter Hospital September 24. In the hospital this case was diagnosed typhoid fever.

No. 192. Company I: Undetermined fever, August 11; furloughed from division hospital September 1.

No. 193. Company B: Remittent malaria, August 11; furloughed from division hospital August 25.

No. 194. Company H: Diarrhea, August 11; furloughed from division hospital August 25.

No. 195. Company K: Intermittent malaria, August 11; furloughed August 21.

No. 196. Company H: Diarrhea, August 11; furloughed August 27.

No. 197. Company I: Malarial fever, August 11; furloughed from division hospital August 22.

No. 198. Company : Intermittent malaria, August 11; furloughed August 22.

No. 199. Company I: Undetermined fever, August 11; furloughed from division hospital August 22.

No. 200. Company B: Intermittent malaria, August 12; furloughed from division hospital August 27.

No. 201. Company K: Typhoid fever, August 12; died in Sternberg Hospital August 29.

No. 202. Company I: Continued fever, August 12; still sick in hospital August 31.

No. 203. Company K: Undetermined fever, August 12; furloughed from division hospital August 21.

No. 204. Company F: Undetermined fever, August 12; furloughed from division hospital August 29.

No. 205. Company A: Typhoid fever, August 13; furloughed from division hospital August 23.

No. 206. Company C: Typhoid fever, August 13; still sick in Sternberg Hospital August 31.

No. 207. Company F: Undetermined fever, August 13; furloughed August 22.

No. 208. Company E: Undetermined fever, August 14; furloughed from division hospital August 23.

No. 209. Company K: Continued fever, August 14; furloughed from division hospital August 21.

No. 210. Company K: Undetermined fever, August 14; furloughed from division hospital August 31.

No. 211. Company M: Intermittent malaria, August 14; still sick in division hospital August 31.

No. 212. Company E: Intermittent malaria, August 14; still sick in division hospital August 31.

No. 213. Company F: Undetermined fever, August 14; furloughed August 22.

No. 214. Company K: Continued fever, August 14; furloughed August 21.

No. 215. Company H: Undetermined fever, August 15; furloughed from division hospital August 22.

No. 216. Company F: Undetermined fever, August 15; furloughed from division hospital August 22.

No. 217. Company G: Intermittent malaria, August 15; furloughed August 25.

No. 218. Company F: Typhoid fever, August 15; died in division hospital August 25.

No. 219. Company D: Undetermined fever, August 15; furloughed from division hospital August 22.

No. 220. Company M: Undetermined fever, August 15; furloughed from division hospital August 31.

No. 221. Company B: Continued fever, August 15; furloughed from division hospital August 23.

No. 222. Company G: Diarrhea, August 15; furloughed August 25.

No. 223. Company A: Intermittent malaria, August 16; furloughed August 21.

No. 224. Company E: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient died August 26.

No. 225. Company C: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 23.

No. 226. Company L: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient died September 14.

No. 227. Company A: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed November 5.

No. 228. Company B: Remittent malaria, August 16; furloughed from division hospital August 27.

No. 229. Company C: Intermittent malaria, August 16; furloughed August 22.

No. 230. Company D: Undetermined fever, August 17; furloughed August 27. In the hospital this case was diagnosed typhoid fever.

No. 231. Company I: Without date or diagnosis; sent to division hospital August 17. Here the disease was diagnosed continued fever, and the patient was still sick August 31.

No. 232. Company F: Without date or diagnosis; sent to Sternberg Hospital August 17. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 3.

No. 233. Company M: Undetermined fever, August 17; still sick in division hospital September 30.

No. 234. Company H: Undetermined fever, August 17; furloughed from division hospital August 21.

No. 235. Company H: Undetermined fever, August 17; furloughed from division hospital August 21.

No. 236. Company F: Continued fever, August 17; still sick in division hospital August 31.

No. 237. Company I: Typhoid fever, August 17; furloughed from division hospital August 23.

No. 238. Company D: Diarrhea, August 18; sent to Leiter Hospital September 3. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 14.

No. 239. Company H: Without date or diagnosis; sent to division hospital August 18. Here the disease was diagnosed continued fever, and the patient was transferred to Leiter Hospital August 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 23.

No. 240. Company M: Typhoid fever, August 19; died in division hospital August 30.

No. 241. Company C: Remittent malaria, August 19; furloughed August 22.

No. 242. Company B: Intermittent malaria, August 19; sick in division hospital August 31.

No. 243. Company F: Without date or diagnosis; sent to Sternberg Hospital August 19. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 13.

No. 244. Company B: Undetermined fever, August 19; furloughed August 31.

No. 245. Company E: Without date or diagnosis; sent to division hospital August 20. Here the disease was diagnosed continued fever, and the patient was furloughed August 28.

No. 246. Company M: Malaria, August 20; furloughed September 7. In the hospital this case was diagnosed typhoid fever.

No. 247. Company A: Without date or diagnosis; sent to division hospital August 20. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 28.

No. 248. Company A: Remittent malaria, August 20; furloughed August 30.

No. 249. Company A: Undetermined fever, August 20; furloughed from division hospital August 29.

No. 250. Company E: Continued fever, August 20; still sick in division hospital August 30.

No. 251. Company E: Undetermined fever, August 20; furloughed from division hospital August 29.

No. 252. Company C: Typhoid fever, August 22; furloughed from division hospital August 28.

No. 253. Company E: Undetermined fever, August 23; furloughed from division hospital August 27.

No. 254. Company H: Typhoid fever, August 23; furloughed from Leiter Hospital September 7.

No. 255. Company H: Typhoid fever, August 23; furloughed from Leiter Hospital October 23.

No. 256. Band: Typhoid fever, August 23; furloughed from Leiter Hospital September 14.

No. 257. Company A: Typhoid fever, August 24; furloughed from Leiter Hospital September 14.

No. 258. Company M: Undetermined fever, August 24; furloughed from division hospital August 29.

No. 259. Company A: Typhoid fever, August 24; furloughed from Leiter Hospital August 29.

No. 260. Company F: Typhoid fever, August 25; still sick in division hospital August 31.

No. 261. Company A: Remittent malaria, August 25; furloughed September 5.

No. 262. Company M: Typhoid fever, August 26; still sick in Sternberg Hospital September 30.

No. 263. Company I: Typhoid fever, August 26; furloughed from division hospital October 25.

No. 264. Company B: Typhoid fever, August 26; furloughed from division hospital September 26.

No. 265. Company B: Typhoid fever, August 26; died in division hospital in October, exact date not given.

No. 266. Company I: Typhoid fever, August 26; furloughed September 14.

No. 267. Company F: Undetermined fever, August 26; still sick September 30.

No. 268. Company B: Typhoid fever, August 26; furloughed from division hospital September 26.

No. 269. Company A: Undetermined fever, August 26; still sick September 30.

No. 270. No company: Typhoid fever, August 27; furloughed from Sternberg Hospital September 7.

No. 271. Company G: Undetermined fever, August 27; still sick September 30.

No. 272. Company G: Undetermined fever, August 27; still sick September 30.

No. 273. Company G: Undetermined fever, August 27; still sick September 30.

No. 274. Company G: Diarrhea, August 27; still sick September 30.

No. 275. Company F: Typhoid fever, August 28; furloughed from Sternberg Hospital September 3.

No. 276. Company I: Typhoid fever, August 28; furloughed from division hospital October 4.

No. 277. Company H: Typhoid fever, August 30; furloughed from Sternberg Hospital October 4.

No. 278. Company A: Typhoid fever, August 30; still sick September 30.

No. 279. Company C: Typhoid fever, August 30; still sick September 30.

No. 280. Company B: Typhoid fever, August 30; furloughed from Sternberg Hospital October 22.

No. 281. Band: Typhoid fever, August 30; furloughed from Sternberg Hospital September 3.

No. 282. Company H: Typhoid fever, August 30; furloughed from Sternberg Hospital September 8.

No. 283. Company L: Typhoid fever, August 30; died in division hospital September 4.

No. 284. Company G: Typhoid fever, August 30; furloughed from Sternberg Hospital October 4.

No. 285. Company E: Typhoid fever, August 30; still sick September 3.

No. 286. Company D: Typhoid fever, August 30; furloughed from division hospital September 10.

No. 287. Company E: Typhoid fever, August 31; furloughed from Sternberg Hospital September 9.

No. 288. Company L: Typhoid fever, August 31; furloughed from Sternberg Hospital September 23.

No. 289. Company D: Typhoid fever, August 31; furloughed from division hospital October 21.

No. 290. Company L: Remittent malaria, August 31; furloughed from Sternberg Hospital October 8.

No. 291. Company B: Typhoid fever, August 31; furloughed from Sternberg Hospital September 26.

No. 292. Company I: Typhoid fever, August 31; furloughed from Sternberg Hospital October 3.

No. 293. Company I: Intermittent malaria, August 31; furloughed from Sternberg Hospital September 12.

No. 294. Company E: Typhoid fever, August 31; furloughed from Sternberg Hospital September 7.

No. 295. Company F: Typhoid fever, August 31; furloughed from Sternberg Hospital September 26.

No. 296. Company M: Typhoid fever, August 31; died in division hospital September 4.

No. 297. Company M: Typhoid fever, August 31; furloughed from Sternberg Hospital September 11.

No. 298. Company B: Typhoid fever, August 31; furloughed from Leiter Hospital October 11.

No. 299. Company E: Typhoid fever, September 1; furloughed from Leiter Hospital September 14.

No. 300. Company E: Intermittent malaria, September 1; furloughed from division hospital September 14.

No. 301. Company A: Typhoid fever, September 2; furloughed from division hospital September 27.

No. 302. Company A: Typhoid fever September 2; furloughed from division hospital October 22.

No. 303. Company F: Typhoid fever, September 3; furloughed from Leiter Hospital September 14.

No. 304. Company A: Typhoid fever, September 3; furloughed from Leiter Hospital October 13.

No. 305. Company B: Typhoid fever, September 3; furloughed from Leiter Hospital September 9.

No. 306. Company A: Typhoid fever, September 3; furloughed from Leiter Hospital September 14.

No. 307. Company E: Typhoid fever, September 3; furloughed from Leiter Hospital September 5.

No. 308. Company L: Typhoid fever, September 3; furloughed from Leiter Hospital September 14.

No. 309. Company M: Typhoid fever, September 3; furloughed from Leiter Hospital September 27.

No. 310. Company B: Typhoid fever, September 3; furloughed from Leiter Hospital October 13.

No. 311. Company B: Typhoid fever, September 3; furloughed from Leiter Hospital September 14.

No. 312. Company G: Continued malaria, September 5; furloughed from Sternberg Hospital September 8.

No. 313. Company B: Typhoid fever, September 5; furloughed from Sternberg Hospital October 4.

No. 314. Company B: Typhoid fever, September 5; died in Sternberg Hospital September 14.

No. 315. Company M: Typhoid fever, September 9; furloughed from Sternberg Hospital November 5.

No. 316. Company L: Typhoid fever, September 10; furloughed from Sternberg Hospital October 8.

No. 317. Company M: Typhoid fever, September 11; furloughed from Sternberg Hospital October 8.

No. 318. Company H: Continued malaria, September 12; furloughed from Sternberg Hospital September 21.

No. 319. Company I: Typhoid fever, September 12; furloughed from Sternberg Hospital October 13.

No. 320. Company C: Typhoid fever, September 12; furloughed from Sternberg Hospital November 5.

No. 321. Company I: Typhoid fever, September 12; furloughed from Sternberg Hospital November 13.

No. 322. Company D: Remittent malaria, September 12; furloughed from Sternberg Hospital September 25.

No. 323. Company H: Typhoid fever, September 12; furloughed from Sternberg Hospital November 5.

The cases in the above list sent to Sternberg Hospital and Leiter Hospital were sent to hospital without diagnosis.

SUMMARY.

Assembled at the armory, 125 West Fourteenth street, New York City. Left May 2, 1898, for Peekskill, N. Y.

Mustered into United States service May 10, 1898.

Arrived at Chickamauga Park, Ga., May 26, 1898.

Strength on arrival, 1,025.

Date of first case of probable typhoid fever, June 10, 1898.

Date of first case of recognized typhoid fever, June 13, 1898.

Left Chickamauga Park, Ga., September 14, 1898.

Strength on departure, 1,292.

Number of cases of probable typhoid fever developed while at Chickamauga 323

Total number of cases of probable typhoid fever developed in the Ninth New York Volunteer Infantry from May to September, 1898 323

These 323 cases were diagnosed as follows:

Typhoid fever.....	139
Enteric fever.....	3
Malaria.....	85
Diarrhea.....	12
Continued fever.....	31
Undetermined fever.....	52
Dysentery.....	1
Total.....	323

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Adler, Frederick	Pvt., L.	1898. Sept. 22	St. Joseph's Hospital, Lexington, Ky.	Typhoid.
Blake, James	Pvt., G.	Aug. 21	New York City	Do.
Buhr, John E.	Corpl., F.	Aug. 25	Leiter Hospital.....	Do.
Burkhardt, Chas.	Pvt., H.	Sept. 2	New York City	Do.
Byrnes, G. V.	Corpl., G.	Oct. 18	do	Do.
Connell, Thomas	Pvt., F.	Oct. 13	do	Do.
Costard, E. P., jr.	Pvt., D.	Aug. 1	Fort McPherson, Ga.	Do.
Cox, George	Band.	Aug. 26	Camp Thomas, Ga.	Do.
Crane, Thomas B.	Pvt., E.	Oct. 26	New York Hospital, N. Y.	Do.
Dean, Frank J.	Corpl., C.	Aug. 26	Camp Thomas, Ga.	Do.
Dodd, Samuel A.	Pvt., M.	Aug. 29	do	Do.
Donohue, M. F.	Sgt., A.	Oct. 2	New York City	Do.
Dowd, William	Pvt., H.	Oct. 24	Presbyterian Hospital, New York City.	Typhoid; intestinal hemorrhage and peritonitis.
Eckstein, A.	Pvt., A.	Aug. 9	Fort McPherson, Ga.	Typhoid.
Ewing, Joseph E.	Pvt., B.	Sept. 8	Chickamauga, Ga.	Do.
Falthe, P. H.	Pvt., H.	Aug. 16	Second Division Hospital, Third Army Corps.	Do.
Gephard, Edward	1st sgt., K.	Sept. 22	Hospital, New York ..	Typhoid and peritonitis.
Hubacher, Herman ..	Pvt., M.	Oct. 30	New York City	Typhoid.
Kiefer, J. F.	Pvt., I.	Sept. 4	do	Do.
Koch, Gustave	Pvt., G.	Nov. 5	do	(Typhoid); acute toxic gastritis
Lawrence, W. H.	Pvt., G.	Oct. 2	do	Typhoid.
Lebeck, C. C.	Pvt., L.	Aug. 2	Camp Thomas, Ga.	Do.

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Lynch, Thomas	Pvt., K.	1898. July 10	.....	(Typhoid). acute malarial enteritis.
Mahoney, M. J.	1st Lt., A.	Oct. 3	New York City	Typhoid.
Merriek, C. M.	Pvt., M.	Aug. 26	do	(Typhoid): malaria and dysentery.
Metz, Edward	Pvt., M.	Sept. 4	Camp Thomas, Ga.	Typhoid.
Moore, Frank	Corpl., L.	do	do	Do.
Moore, Warren J.	Pvt., K.	Aug. 29	do	Do.
Nauheimer, John	Pvt., A.	do	Chickamauga, Ga.	Do.
Nelle, Robert E.	Pvt., F.	Oct. 17	New York City	(Typhoid).
O'Shaughnessy, F. J.	Pvt., C.	Sept. 21	do	Typhoid.
Reardon, George	Pvt., E.	Aug. 2	Camp Thomas, Ga.	Do.
Reiner, Henry	Pvt., K.	July 22	do	Do.
Ryba, Charles	Pvt., L.	Sept. 25	Fort Thomas, Ky.	(Typhoid): uræmic coma.
Seward, C. W.	2d Lt., C.	Sept. 16	His home, Montclair, N. J.	Typhoid.
Seward, E., jr.	1st Lt., C.	Oct. 17	Leiter U. S. General Hospital, Chickamauga, Ga.	Do.
Shannon, James P.	Pvt., K.	Sept. 3	Chickamauga, Ga.	Do.
Simpson, G. McC.	Pvt., B.	Aug. 23	do	Do.
Stoffers, George H.	Corpl., B.	Oct. 9	do	Do.
Stofflet, C. A.	Pvt., M.	Sept. 17	New York City	Do.
Stone, William	— B.	Sept. 14	Chickamauga, Ga.	Do.
Syuart, F. J.	Sgt., M.	Sept. 10	New York City	Do.
Wald, Frederick	Pvt., E.	Sept. 1	Camp Thomas, Ga.	Do.
Walker, F. D. L.	1st Lt., H.	Sept. 20	New York City	Do.
Watson, John W.	Corpl., M.	Oct. 5	St. Catherine's Hospital, Brooklyn, N. Y.	Do.
White, George	Pvt., M.	Sept. 25	Saranac Lake, N. Y.	Do.
Total deaths				46
Deaths due to typhoid fever				46
Percentage of deaths among probable cases of typhoid fever (323), 14.24.				
Percentage of deaths among recognized cases of typhoid fever (139), 33.09.				

We inspected this regiment September 10, 1898. The following is taken from our stenographic notes made at that inspection.

There are three battalion sinks. It is supposed that these were filled with straw and burned out each morning. This attempt at disinfection is practically worthless. Fecal matter is seen deposited around trees and elsewhere on the ground. A vile odor permeates the air around the sinks.

We wish here to speak of the attempts made by different regiments at Chickamauga to disinfect the sinks by means of burning straw. Straw was collected from the corrals every morning, thrown into the sink, and set on fire. This attempt at disinfection was practically worthless. Frequently it happened that the straw was wet and did not burn at all. In some instances the straw on top burned, but the large amount of water in the sink prevented disinfection of its contents.

The following is a condensed statement of the information which we obtained from Maj. Samuel D. Hubbard, surgeon of this regiment:

This regiment assembled at Peekskill, N. Y., in April, and was mustered into the service of the United States early in May. The water supply at Peekskill is abundant and above suspicion. It comes from the Catskill Mountains. The site at Peekskill occupies a large plateau facing the Hudson River and elevated some 200 feet above it. The regiment left Peekskill May 24 without a sick man and arrived at Chickamauga, Ga., May 26. For some time after arriving at Chickamauga water was hauled from Crawfish Spring; later, pipes carrying the Chickamauga Creek water were laid through the encampment. We had three large sinks, one for each battalion. These were located about 80 feet from the kitchens. When these were partially filled their contents were covered and new sinks were dug back farther and at a distance of

about 200 feet from the kitchens. We endeavored to cover the contents of these sinks with sand and with dust swept up in the regimental camp and by burning straw in the pits. I made a sanitary inspection of the camp twice each day. During the first days we had difficulty in getting tools necessary to dig the sinks, and during this time the men defecated on the ground. When we obtained the tools we covered the fecal matter where it lay on the ground, but did not take it up. The drainage from the hills occupied by the Second Kentucky Volunteer Infantry ran through our camp.

We had great difficulty in digging sinks to a depth of 3 or more than 3½ feet. In attempting to dig these sinks we encountered large boulders which had to be blasted or broken inside of the sinks. We obtained some water from driven wells. The water from these wells became muddy after heavy rains. During the early part of June we had a great deal of diarrhea, which I attributed largely to the fact that men bought questionable food from hucksters and ate largely of it.

When asked concerning the possibility of water that was hauled from springs in barrels being contaminated, Major Hubbard told us that in one of the Wisconsin regiments a man had been found hidden in an empty barrel on a wagon on its way to the spring to be filled with water. The man used this means to pass the guard.

Major Hubbard one morning found fecal matter deposited in an empty barrel where some one had defecated in this barrel during the night. The barrel was immediately broken up and burned.

The tents were without flooring for some months after the arrival of the troops. In attempting to keep the tents dry the men dug ditches around them, and some of these were dug so deep and so large that water stood in them.

Major Hubbard believed that the men of his regiment became infected with typhoid fever on account of their association with infected men in the First Mississippi. In fact, many medical officers at Chickamauga looked upon the First Mississippi as the regiment which brought the infection of typhoid fever into the park. As we shall see later, the First Mississippi did undoubtedly bring typhoid fever to Chickamauga, but this is equally true of the great majority of the other regiments. We will probably take up this point later.

In regard to this matter Major Hubbard made the following statement:

The First Mississippi brought the first case of typhoid fever to the division hospital, and about that time the men from the two regiments were doing a great deal of visiting, and the first thing I knew typhoid fever began to crop out in our own regiment. I think that the disease was spread by the intermingling of the soldiers of these regiments.

On June 10 Major Hubbard was detached from his regiment and sent to the division hospital. He stated that more than 90 per cent of the cases of typhoid fever brought to this hospital were not properly diagnosed by the regimental surgeon.

After Major Hubbard had been detached from this regiment to the hospital Capt. John B. L'Honnmedieu became senior medical officer of this regiment. Cap-

tain L'Hommedieu, in his testimony to us, stated that he did not believe that typhoid fever appeared in the Ninth New York until July 6. This is an evidence of how untrustworthy memory and general impressions may be. The regimental records show that a disease diagnosed as enteric fever appeared in this regiment as early as June 13, and that numerous cases had appeared, some with a diagnosis of typhoid fever, before July 6. On this point Captain L'Hommedieu made the following statement:

Cases of typhoid fever began to straggle in. The diagnosis could not be made with certainty until they passed out of our hands. We were having a great many cases of remittent malaria, and some of these proved to be typhoid fever. We had no hospital in the regiment. Men were seen in quarters and were picked up and transferred to the division hospital. Our examination was slight, and we were not able to make a positive diagnosis. Perhaps we would not hear of the development of these cases of typhoid fever until two or three weeks had elapsed.

He thought that the great influx of typhoid fever began about the 15th of July. This increase in the number of cases of typhoid fever caused this command to change its water supply from the piped water of Chickamauga Creek to that obtained from Blue Springs. An attempt was made to filter all of the water used by this brigade, but the amount obtained in this way was insufficient.

When asked his opinion as to the origin of typhoid fever in the Ninth New York Volunteer Infantry, Captain L'Hommedieu made the following statement:

There was a case of typhoid fever in a family living not far from our camp. That was the first case of typhoid fever I heard of; later a case appeared in the First Mississippi. This was the first that occurred in our division, and then there was quite a number of cases in the First Mississippi. Some time later on we had a case in the Ninth New York, and the disease began to spread, I think, from the sinks. I do not think that we were ever able to disinfect the sinks as it should have been done. On at least two occasions the sinks overflowed and polluted the ground for a distance of about 10 feet about them. Great difficulty was experienced in preventing the men from defecating around the camp, especially during the night. Men with diarrhea would get up at night and going to the sink they would stop half way, and in the morning I would find a great deal of excrement deposited on the ground. In all cases I attempted to have this removed immediately, but this attempt was not always successful. Sometimes the fecal matter was covered where it was deposited. The garbage was burned.

According to Captain L'Hommedieu the men of this regiment did not have access to water from driven wells.

It will be noticed that in number of deaths from typhoid fever this regiment leads all others at Chickamauga.

COMMUNICATIONS FROM THE SURGEONS OF THE NINTH NEW YORK.

Medical officers.

Samuel D. Hubbard, major and surgeon, New York City.

Albert W. Preston, captain and assistant surgeon, New York City.

John B. L'Hommedieu, captain and assistant surgeon, New York City.

The following extracts are taken from a letter from Major Hubbard under date of July 16, 1899:

I desire to state that I was firmly convinced at the time that the great majority of the cases diagnosed as "undetermined fever," "malaria," "diarrhea," etc., were typhoid fever. Early in June, 1898, I suggested to Major Bergen, of the Fifty-second Iowa, then in command of the Second Division hospital of the Third Army Corps, that it would be a wise plan to isolate in separate tents all cases suspected of being typhoid fever. Action was taken in accordance with this suggestion, but in a short time the number of cases was beyond our capacity for caring for them. I insisted at that time that we were on the verge of a typhoid epidemic. I took measures to secure disinfectants, but my claim that the disease prevalent at that time was typhoid fever raised against me the opposition of certain superior line officers. Therefore, it happened that for a time disinfectants were not only deficient, but none were to be had.

This regiment assembled in the armory at 125 West Fourteenth street, New York City, and on May 2, 1898, left by boat for Peekskill. During the stay of our regiment there were no cases of typhoid fever in that village. We remained in the State encampment until May 24, when we left for Chickamauga Park, Ga., arriving May 26, 1898.

The first case of typhoid fever appeared early in June; I should think about June 10 or 12.

Our first camp at Chickamauga was on a slope to the rear of the headquarters of the First Brigade of the Second Division of the Third Army Corps. It was located in the woods, and about 300 feet in the rear of our camp was a ditch about 4 feet deep. This ditch drained our camp and that of the First Arkansas.

During the first days of our stay in this camp, water was hauled by teams from any place where it could be obtained. Wagons were driven from pump to pump until, one after another, the wells were emptied. This fact alone convinced me that the water in these wells was surface water. Water obtained from the wells in our regiment was of a yellowish color and deposited, on standing, quite a sediment.

Later, pipe lines carrying Chickamauga Creek water were laid on top of the ground; two or three weeks later we were ordered to sink these pipes to a distance of 1 foot in the earth. This water was absolutely unfit for anything. It was not clear enough to serve as wash water. The deposit formed in a glass measured an inch in thickness. It was as yellow as saffron and contained floating particles. It was absolutely impossible to filter this water. Later, water was obtained from Blue and Crawfish springs. This water was clear and more pleasing to the taste.

When the camp was laid out, we had no tools for the digging of sinks. I personally visited the company streets and asked the men to use the ditch at our rear until we could get tools with which to dig sinks. Night after night the space between the Ninth New York and the Fifth Missouri was lined with deposits of fecal matter. Not having spades with which to cover this, it was allowed to lie there and dry.

Flies became numerous, and as the kitchen was only 30 feet distant, it was only a question of time when the food would be contaminated. At last we obtained one pick and two shovels, and with these we dug a sink, but before we could finish and dig a second one the first one had been filled. Diarrheas now became common. Additional tools were obtained, and three battalion sinks were dug. Many men would not use the sinks on the plea that some of the men had body lice and left them on the seats. I obtained permission from the colonel of the regiment to arrest any man found defecating outside of the sinks. This order had some effect, but at night the nuisance was almost as bad as it had been in the daytime.

About this time I was transferred to the division hospital, and Captain L'Hommedieu became regimental surgeon. After going to the hospital I sent fifty specimens of blood to Washington, in

order that they might be subjected to a Widal test. About 90 per cent of these specimens gave positive results.

At the division hospital the shortage of orderlies caused a great many patients who were in no condition to get out of bed to walk a distance into the woods when they wished to defecate. At first the sheets were boiled, but soon the number of soiled sheets became so great that we were not able to care for them. After a while some of the dirty sheets were sent to the laundries in Chattanooga, and many others which were badly soiled were burned. At first the discharges from fever patients were dumped onto the fire, but the incineration was by no means complete. Sometimes an orderly would go to sleep, let the fire die out, and the discharges would be thrown on the ground. We then constructed a large sink for the reception of the discharges from the patients. As soon as this sink was filled to within 1 foot of the top it was covered with brushwood and dirt. From sinks thus covered the contents sometimes soaked through and contaminated the ground about, especially after heavy rains.

Powdered chloride of lime was kept in all the empty bedpans. After the bedpan had received the discharge from the patient a pint of water was added and the vessel with its contents allowed to stand for a few minutes outside of the tent; then the stool was emptied into the sink. A barrel of strong solution of lime was kept near the sink, and orderlies were instructed to wash the bedpans thoroughly in these barrels. After this had been done powdered chloride of lime was placed in the bedpan, which was returned to a bench outside of the tent, there to await another call. This sink was covered with a box with a lid, in order to keep the flies out. Straw was burned over the battalion sinks, but this was an inefficient attempt at sterilization.

Early in July, 1898, I recommended portable incinerators for camp use. This recommendation was, however, never accepted. I think that some light can be thrown on the high mortality in this regiment by a statement concerning the character of the men of which it was composed. I examined all the recruits for this regiment. I made 4,500 examinations in order to pick out 1,300 men. Practically all of the men belonged to one class. The only advantage that one man had over another was that the selected men did not have a physical deformity. These men belonged to the roving class of humanity. They were whisky-soaked, homeless wanderers, the majority of whom gave Bowery lodging houses as their places of residence. While other regiments from New York City had a fair proportion of men from the country, the recruits to the Ninth New York did not contain such men, or at least but few of them. Certainly this regiment was composed of a class of men likely to be susceptible to disease and in whom typhoid fever would be likely to prove fatal in an unusually large number of cases. The regiment was hastily recruited, and while the greatest care was used to get the best, the best had to be selected from the worst.

This regiment left Chickamauga Park September 14, 1898, and was mustered out November 16, 1898. Those sick after reaching New York were distributed to the various hospitals in that city. All the cases of typhoid fever which I can remember, and which I do not find in your report, are those of officers. I, myself, contracted typhoid fever September 29 and was sick until December 1. Major Weiners, Captain Meyer, and Lieutenants Lynch and Croft all had typhoid fever. I think that these are all that I do not see in your records.

The second location of our regiment at Chickamauga was in the open, and while it was much better than the first one, before we had moved typhoid fever had become so widely disseminated that it continued to spread.

FIRST ARKANSAS VOLUNTEER INFANTRY.

First Brigade, Second Division, Third Army Corps.

This regiment was mustered into the United States service at Little Rock, Ark., May 19, 1898, by Captain

Trippe of the Tenth Cavalry. The regiment left Little Rock on May 25 and arrived at Camp George H. Thomas, Chickamauga Park, Ga., May 27, 1898. The medical officer in charge was Maj. J. C. Minor.

CONDENSED SICK REPORT FOR MAY.

Mean strength, not given.	
Intermittent malaria.....	25
Remittent malaria.....	4
Diarrhea.....	24
Dysentery.....	2
Other diseases.....	41
Total.....	96

The June report is signed by Lieut. E. C. Hay, who makes the following statement:

The prevailing sicknesses in this regiment have been malarial manifestations, dyspepsia, and bowel irregularities. I consider that the drills in the hottest part of the day, the impure and unwholesome drinking water, responsible for a large portion of our sickness. I have experienced great trouble in having the company commanders carry out my instructions on hygiene. These malarial explosions have been induced by the change to higher altitude and the heavy drinking. The drill hour I have succeeded in having changed to the early hours of the morning and late hours of the evening, and think within a few weeks our sick percentage will be very much reduced.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,191
Intermittent malaria.....	131
Remittent malaria.....	21
Acute diarrhea.....	103
Dysentery.....	11
Typhoid fever.....	14
Pernicious malaria.....	8
Other diseases.....	158
Total.....	446

The cases of pernicious and some of those of remittent malaria were probably typhoid fever. It will be seen that while this regiment reached Chickamauga Park on May 27 its first case of recognized typhoid fever appeared June 6, and numerous cases immediately followed. It is, therefore, a fair presumption that this regiment became infected before it left its camp at Little Rock, Ark. This must be regarded as one of the regiments which brought the typhoid infection into the camp at Chickamauga Park.

In the July report Lieutenant Hay makes the following statement:

I will state that the malarial manifestations have been greatly reduced this month, and what has occurred has been confined mostly to the recruits. The general health of the regiment has materially improved, but the sick list has been augmented by an invasion of measles and catarrhal inflammation of the mucous membranes, caused by the exposure of the men during this rainy spell while at rifle practice, and from the camp being pitched in the shade. A great deal of organic matter and garbage has been deposited between the different regiments, instead of being deposited at some remote point. These piles are putrefying, and emit very offensive fumes, and, of course, are anything but conducive to good health. The filters provided for the regiment have not

proven practicable, and I still urge that ample means be provided for boiling of all drinking water, which would materially reduce the number of enteric disturbances.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,343
Intermittent malaria.....	129
Remittent malaria.....	76
Acute diarrhea.....	47
Dysentery.....	11
Typhoid fever.....	19
Pernicious malaria.....	5
Other diseases.....	161
Total.....	448

Some of the typhoid cases included in this month are those brought over from the preceding month. Many of the cases of remittent malaria are greatly prolonged and undoubtedly are typhoid fever. However, we will look to the hospital reports for confirmation of this suspicion. It will be seen that typhoid fever did not abate in this regiment during the month of July.

The August report is signed by Lieut. C. P. Meriweather, who makes the following statement:

Malaria has been the prevailing disease during the past month. It has been brought about by the great amount of rain during June and July, and from the fact that all the regiments in the park skinned the ground of every particle of vegetable matter on the sites of their camps, and in most instances it was thrown in heaps near their own camp. The decomposition of this matter thus heaped up has produced more malaria than is usually found in the worse malarial districts. A great deal of acute and subacute bronchitis prevails in the regiment, from the fact that we have had measles in the regiment since mustering into service.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,287
Intermittent malaria.....	211
Remittent malaria.....	76
Acute diarrhea.....	75
Dysentery.....	30
Pernicious malaria.....	3
Typhoid fever.....	5
Other diseases.....	328
Total.....	728

From this report it would appear that typhoid fever had greatly decreased since last month in this regiment. However, this is probably not the case, but the apparent decrease is more likely due to the change in surgeons.

The September report is signed by Maj. J. C. Minor, who states:

The regiment broke camp at Chickamauga Park, Ga., on September 8, 1898, and proceeded to Fort Logan H. Roots, Ark., arriving there September 10. The command is on furlough for one month from September 15, 1898.

CONDENSED SICK REPORT FOR SEPTEMBER.

This report covers a detachment of only about 120 men, all others having been discharged or furloughed. It also includes the sick sent to the hospitals at Chickamauga Park before leaving that place.

Intermittent malaria.....	95
Remittent malaria.....	3
Acute diarrhea.....	9
Dysentery.....	3
Typhoid fever.....	3
Other diseases.....	84
Total.....	197

It would appear from this report that this regiment had by this time become almost free from typhoid fever. However, we are inclined to think that this is more apparent than real.

We have what appears to be a sick report for this regiment for the month of October, but it shows only 82 cases in all; and none of these are of special interest to us, except the cases given in previous reports. In several of these the diagnosis has been changed from malaria to typhoid fever. There seems to have been one death from tobacco narcotism, and another serious case of illness from the same cause. Most of the cases reported are the so-called intermittent and remittent malarias of only a few days' duration. If we were to accept this record as that of the regiment for the month of October, it must be admitted that going on furlough practically relieved the regiment from all serious illness.

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

No. 1. Company F: Without date or diagnosis; sent to division hospital June 2. Here the disease was diagnosed intermittent malaria, and the man was returned to duty June 13.

No. 2. Company C: Typhoid fever, June 3 to August 2.

No. 3. Company I: Typhoid fever, June 6; furloughed July 21.

No. 4. Company A: Without date or diagnosis; sent to division hospital June 6. Here the disease was diagnosed dysentery, and the patient was returned to duty June 19.

No. 5. Company C: Typhoid fever, June 7; furloughed July 11.

No. 6. Company F: Without date or diagnosis; sent to division hospital June 8. Here the disease was diagnosed remittent malaria, and the patient was furloughed June 14.

No. 7. Company M: Dysentery, June 10; granted sick leave without date. There is no record of this man having returned to duty at any time.

No. 8. Company M: Without date or diagnosis; sent to Leiter Hospital June 10. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 27.

No. 9. Company L: Typhoid fever, June 10 to July 25.

No. 10. Company L: Typhoid fever, June 10; discharged July 17.

No. 11. Company C: Without date or diagnosis; sent to division hospital June 11. Here the disease was diagnosed remittent malaria, and the man returned to duty July 7.

No. 12. Company I: Without date or diagnosis; sent to division hospital June 12. Here the disease was diagnosed intermittent malaria, and the patient was furloughed June 21.

No. 13. Company L: Without date or diagnosis; sent to division hospital June 13. Here the disease was diagnosed typhoid fever, and the patient was returned to duty July 5.

No. 14. Company K: Typhoid fever, June 14; died July 9.

No. 15. Company H: Without date or diagnosis; sent to hospital June 15. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.

No. 16. Company B: Typhoid fever, June 15; furloughed June 29.

No. 17. Company F: Without date or diagnosis; sent to division hospital June 15. Here the disease was diagnosed dysentery, and the patient was returned to duty July 9.

No. 18. Company A: Dysentery, June 16; granted sick leave without date. There is no evidence that this man returned to duty.

No. 19. Company F: Without date or diagnosis; sent to division hospital June 16. Here the disease was diagnosed remittent malaria, and the patient was returned to duty July 2.

No. 20. Company E: Malaria, June 16; granted sick leave June 22. There is no evidence that this man ever returned to duty.

No. 21. Company M: Without date or diagnosis; sent to division hospital June 18. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.

No. 22. Company D: Typhoid fever, June 18 to July 12.

No. 23. Company H: Without date or diagnosis; sent to division hospital June 18. Here the disease was diagnosed typhoid fever, and the patient was transferred to Leiter Hospital July 12.

No. 24. Company H: Without date or diagnosis; sent to division hospital June 18. Here the disease was diagnosed remittent malaria, and the patient remained sick July 31.

No. 25. Company L: Without date or diagnosis; sent to division hospital June 19. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.

No. 26. Company G: Typhoid fever, June 19 to July 26.

No. 27. Company K: Without date or diagnosis; sent to division hospital June 19. Here the disease was diagnosed remittent malaria, and the patient was returned to duty July 27.

No. 28. Company D: Without date or diagnosis; sent to division hospital June 21. Here the disease was diagnosed typhoid fever, and the patient was furloughed July 7.

No. 29. Company D: Typhoid fever, June 21; died July 21.

No. 30. Company L: Typhoid fever, June 22; furloughed August 17.

No. 31. Company A: Typhoid fever, June 22; furloughed July 21.

No. 32. Company I: Typhoid fever, June 23; died July 16.

No. 33. Company C: Typhoid fever, June 24; furloughed July 16.

No. 34. Company not given. Without date or diagnosis; sent to division hospital June 24. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 10.

No. 35. Company D: Typhoid fever, June 24 to July 18.

No. 36. Company D: Without date or diagnosis; sent to division hospital June 24. Here the disease was diagnosed remittent malaria, and the patient was returned to duty July 15.

No. 37. Company E: Without date or diagnosis; sent to division hospital June 24. Here the disease was diagnosed remittent malaria, and the patient was returned to duty July 14.

No. 38. Company I: Without date or diagnosis; sent to division hospital June 24. Here the disease was diagnosed intermittent malaria, and the patient was furloughed July 2.

No. 39. Company F: Without date or diagnosis; sent to division hospital June 24. Here the disease was diagnosed remittent malaria, and the patient was returned to duty July 25.

No. 40. Company F: Typhoid fever, June 29; furloughed July 24.

No. 41. Company G: Without date or diagnosis; sent to division hospital June 30. Here the disease was diagnosed malaria, and the patient remained sick July 31.

No. 42. Company D: Typhoid fever, June 30 to August 9.

No. 43. Company F: Typhoid fever, July 1; sent to Fort McPherson July 25.

No. 44. Company M: Without date or diagnosis; sent to division hospital July 1. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 14.

No. 45. Company F: Typhoid fever, July 2; furloughed August 10.

No. 46. Company A: Without date or diagnosis; sent to division hospital July 2. Here the disease was diagnosed intermittent malaria, and the patient was furloughed July 13.

No. 47. Company M: Without date or diagnosis; sent to division hospital July 2. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 10.

No. 48. Company D: Typhoid fever, July 3; furloughed July 21.

No. 49. Company D: Typhoid fever, July 3; furloughed July 12.

No. 50. Company C: Typhoid fever, July 3; furloughed July 21.

No. 51. Company G: Without date or diagnosis; sent to division hospital July 5. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 16.

No. 52. Company I: Typhoid fever, July 6; sent to Fort McPherson July 25.

No. 53. Company F: Without date or diagnosis; sent to division hospital July 7. Here the disease was diagnosed remittent malaria, and the patient was returned to duty July 26.

No. 54. Company L: Without date or diagnosis; sent to division hospital July 7. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 15.

No. 55. Company F: Without date or diagnosis; sent to division hospital July 8. Here the disease was diagnosed remittent malaria, and the patient was furloughed July 18.

No. 56. Company I: Typhoid fever, July 9; sent to Fort McPherson July 24.

No. 57. Company C: Without date or diagnosis; sent to division hospital July 11. Here the disease was diagnosed intermittent malaria, and the patient was furloughed July 21.

No. 58. Company F: Typhoid fever, July 14; sent to Fort McPherson July 25.

No. 59. Company I: Without date or diagnosis; sent to division hospital July 15. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.

No. 60. Company C: Without date or diagnosis; sent to division hospital July 15. Here the disease was diagnosed remittent malaria, and the patient remained sick in hospital July 31.

No. 61. Company G: Without date or diagnosis; sent to division hospital July 17. Here the disease was diagnosed typhoid fever, and the patient died July 21.

No. 62. Company L: Remittent malaria, July 17; furloughed August 26.

No. 63. Company I: Remittent malaria, July 18; furloughed August 19.

No. 64. Company H: Without date or diagnosis; sent to division hospital July 20. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 1.

No. 65. Company M: Without date or diagnosis; sent to division hospital July 20. Here the disease was diagnosed intermittent malaria, and the patient was furloughed August 6.

No. 66. Company F: Diarrhea, July 21; furloughed August 10. This man had dysentery July 3 to 9.

No. 67. Company E: Intermittent malaria, July 21; furloughed August 25.

No. 68. Company F: Intermittent malaria, July 21; furloughed August 10.

No. 69. Company E: Without date or diagnosis; sent to division hospital July 21. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 1.

No. 70. Company D: Remittent malaria, July 23; sent to division hospital without date. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 20.

No. 71. Company F: Without date or diagnosis; sent to division hospital July 23. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.

No. 72. Company F: Intermittent malaria, July 24; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 16. This man is reported as having had malaria from June 24 to July 9.

No. 73. Company L: Typhoid fever, July 24; furloughed August 31.

No. 74. Company L: Without date or diagnosis; sent to division hospital July 25. Here the disease was diagnosed remittent malaria, and the patient remained sick in the hospital August 31.

No. 75. Company L: Without date or diagnosis; sent to Leiter Hospital July 27; died August 7.

No. 76. Company F: Without date or diagnosis; sent to division hospital July 27. Here the disease was recorded as undetermined fever, and the patient was furloughed August 27.

No. 77. Company M: Without date or diagnosis; sent to division hospital July 27. Here the disease was diagnosed remittent malaria, and the patient remained sick in hospital August 31.

No. 78. Company C: Without date or diagnosis; sent to division hospital July 27. Here the disease was diagnosed remittent malaria, and the patient remained sick in hospital August 31.

No. 79. Company H: Without date or diagnosis; sent to division hospital July 27. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 5.

No. 80. Company M: Typhoid fever, July 29; furloughed September 26.

No. 81. Company A: Remittent malaria, July 30; furloughed July 30. There is no evidence that this man returned to duty at any time.

No. 82. Company A: Without date or diagnosis; sent to division hospital July 30. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.

No. 83. Company C: Without date or diagnosis; sent to division hospital July 30. Here the disease was diagnosed dysentery and the patient remained sick in hospital August 31.

No. 84. Company E: Typhoid fever, July 31; sent to Leiter Hospital August 22.

No. 85. Company B: Without date or diagnosis; sent to division hospital July 31. Here the disease was diagnosed remittent malaria, and the patient remained sick in hospital August 31.

No. 86. Company C: Dysentery, July 31; died August 9.

No. 87. Company D: Without date or diagnosis; sent to division hospital July 31. Here the disease was diagnosed remittent malaria, and the patient remained sick in hospital August 31.

No. 88. Company H: Without date or diagnosis; sent to division hospital July 31. Here the disease was diagnosed continued fever, and the patient is recorded as having been returned to duty August 21.

No. 89. Company F: Remittent malaria, July 31; furloughed August 19.

No. 90. Company F: Without date or diagnosis; sent to division hospital August 1. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 15.

No. 91. Company F: Without date or diagnosis; sent to division hospital August 1. Here the disease was diagnosed remittent malaria, and the patient was returned to duty August 15.

No. 92. Company G: Without date or diagnosis; sent to division hospital August 1. Here the disease was diagnosed intermittent malaria, and the patient was furloughed August 9.

No. 93. Company H: Remittent malaria, August 2; furloughed August 21.

No. 94. Company B: Without date or diagnosis; sent to division hospital August 2. Here the disease was diagnosed continued fever, and the patient remained sick in hospital August 31.

No. 95. Company D: Diarrhea, August 2; furloughed August 21.

No. 96. Company B: Without date or diagnosis; sent to division hospital August 5. Here the disease was diagnosed continued fever, and the patient was furloughed August 27.

No. 97. Company C: Remittent malaria, August 5; sent to Sternberg Hospital August 18. The records of Sternberg Hospital do not contain the name of this man.

No. 98. Company C: Continued malaria, August 5; sent to Sternberg Hospital August 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 17.

No. 99. Company K: Without date or diagnosis; sent to division hospital August 5. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 15.

No. 100. Company I: Intermittent malaria, August 6; furloughed August 21.

No. 101. Company B: Remittent malaria, August 7; furloughed August 30.

No. 102. Company D: Without date or diagnosis; sent to division hospital August 7, and transferred to Sternberg Hospital August 9. Here the case was diagnosed typhoid fever, but further disposition is not given.

No. 103. Company D: Intermittent malaria, August 8; furloughed August 27.

No. 104. Company L: Without date or diagnosis; sent to division hospital August 8. Here the disease was diagnosed dysentery, and the patient was furloughed August 18.

No. 105. Company M: Remittent malaria, August 10; furloughed August 21.

No. 106. Company M: Without date or diagnosis; sent to division hospital August 11. Here the disease was diagnosed typhoid fever, and the patient died August 29.

No. 107. Company H: Without date or diagnosis; sent to division hospital August 11. Here the disease was diagnosed continued fever, and the patient was furloughed August 18.

No. 108. Company G: Remittent malaria, August 11; furloughed August 27.

No. 109. Company E: Without date or diagnosis; sent to division hospital August 12. Here the disease was diagnosed intermittent malaria, and the patient was furloughed August 22.

No. 110. Company K: Intermittent malaria, August 12; furloughed August 25.

No. 111. Company M: Dysentery, August 12; furloughed August 17.

No. 112. Company not given: Diarrhea, August 12; furloughed August 21.

No. 113. Company A: Intermittent malaria, August 12; furloughed August 21.

No. 114. Company E: Intermittent malaria, August 12; furloughed August 28.

No. 115. Company H: Typhoid fever, August 13; died September 3.

No. 116. Company I: Continued malaria, August 13; furloughed August 27.

No. 117. Company B: Diarrhea, August 13; furloughed August 18.

No. 118. Company E: Intermittent malaria, August 13; furloughed August 23.

No. 119. Company H: Malaria, August 13; furloughed August 31. This man is recorded as having had malaria July 18 to 21.

No. 120. Company K: Remittent malaria, August 13; died August 27.

No. 121. Company B: Remittent malaria, August 13; furloughed August 30.

No. 122. Company B: Remittent malaria, August 13; furloughed August 22.

No. 123. Company B: Diarrhea, August 13; furloughed August 30.

No. 124. Company G: Intermittent malaria, August 14; furloughed August 30.

No. 125. Company H: Diarrhea, August 14; furloughed August 24.

No. 126. Company E: Dysentery, August 14; furloughed August 23. This man is recorded as having had malaria July 2 to 8, and again August 2 to 6.

No. 127. Company B: Without date or diagnosis; sent to division hospital August 14. Here the disease is recorded as undetermined fever, and the patient remained sick in hospital August 31.

No. 128. Company C: Without date or diagnosis; sent to division hospital August 14. Here the disease was diagnosed continued fever, and the patient remained sick in hospital August 31.

No. 129. Company M: Intermittent malaria, August 14; furloughed August 21.

No. 130. Company G: Without date or diagnosis; sent to division hospital August 14. Here the disease was diagnosed continued fever, and the patient was furloughed August 21.

No. 131. Company A: Intermittent malaria, August 15; sent to division hospital without date. Here the diagnosis was changed to typhoid fever, and the patient was furloughed August 27.

No. 132. Company A: Dysentery, August 15; furloughed August 21.
No. 133. Company E: Remittent malaria, August 15; still sick in hospital August 31.
No. 134. Company H: Intermittent malaria, August 15; furloughed August 28.
No. 135. Company D: Without date or diagnosis; sent to division hospital August 15. Here the disease was diagnosed continued fever, and the patient was furloughed August 17.
No. 136. Company C: Intermittent malaria, August 15; furloughed August 21.
No. 137. Company A: Dysentery, August 15; furloughed August 21.
No. 138. Company A: Dysentery, August 15; furloughed August 21. This man is recorded as having had dysentery July 3 to 9.
No. 139. Company E: Dysentery, August 16; still sick August 31. This man is recorded as having been in hospital with malaria June 24 to July 7.
No. 140. Company A: Intermittent malaria, August 16; still sick August 31.
No. 141. Company A: Continued malaria, August 16; still sick August 31.
No. 142. Company H: Remittent malaria, August 16; still sick August 31.
No. 143. Company D: without date or diagnosis; sent to division hospital August 16. Here the disease was diagnosed continued malaria, and the patient was furloughed August 22.
No. 144. Company F: Without date or diagnosis; sent to division hospital August 16. Here the disease was diagnosed continued malaria, and the patient remained sick August 31.
No. 145. Company E: Dysentery, August 16; still sick August 31.
No. 146. Company L: Remittent malaria, August 16; still sick August 31.
No. 147. Company C: Dysentery, August 16; still sick August 31.
No. 148. Company H: Without date or diagnosis; sent to division hospital August 16. Here the disease was diagnosed dysentery, and the patient was furloughed August 27.
No. 149. Company E: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient died August 30.
No. 150. Company B: Remittent malaria, August 18; still sick in hospital August 31.
No. 151. Company H: Without date or diagnosis; sent to division hospital August 18. Here the disease was diagnosed remittent malaria, and the patient was furloughed August 27.
No. 152. Company K: Without date or diagnosis; sent to division hospital August 18. Here the disease was diagnosed continued fever, and the patient died September 19.
No. 153. Company K: Without date or diagnosis; sent to division hospital August 18. Here the disease was diagnosed continued fever, and the patient remained sick August 31.
No. 154. Company D: Without date or diagnosis; sent to division hospital August 19. Here the diagnosis is recorded as undetermined fever, and the patient was furloughed August 30.
No. 155. Company F: Continued fever, August 19; furloughed August 27.
No. 156. Company D: Continued malaria, August 19; furloughed August 26.
No. 157. Company C: Diarrhea, August 19; furloughed August 23.
No. 158. Company C: Intermittent malaria, August 19; furloughed August 21.
No. 159. Company F: Continued malaria, August 19; sent to Sternberg Hospital August 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 9.
No. 160. Company A: Diarrhea, August 19; furloughed August 23.
No. 161. Company B: Dysentery, August 19; still sick in hospital August 31.
No. 162. Company B: Intermittent malaria, August 19; sent to Leiter Hospital September 3. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 15.

No. 163. Company A: Dysentery, August 20; still sick August 31.
No. 164. Company H: Diarrhea, August 20; still sick August 31.
No. 165. Company E: Intermittent malaria, August 20; furloughed August 27.
No. 166. Company E: Without date or diagnosis; sent to division hospital August 20. Here the disease was diagnosed continued fever, and the patient was furloughed August 27.
No. 167. Company C: Remittent malaria, August 21; still sick August 31.
No. 168. Company F: Intermittent malaria, August 21; still sick August 31.
No. 169. Company I: Continued malaria, August 22; still sick September 30.
No. 170. Company K: Without date or diagnosis; sent to Leiter Hospital August 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 13.
No. 171. Company E: Intermittent malaria, August 23; sent to division hospital August 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 7.
No. 172. Company H: Without date or diagnosis; sent to Leiter Hospital August 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 14.
No. 173. Company B: Intermittent malaria, August 24; still sick September 30.
No. 174. Company I: Dysentery, August 25; still sick September 30.
No. 175. Company G: Fever, August 25; still sick September 30.
No. 176. Company C: Jaundice, August 25; sent to Sternberg Hospital September 3. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 4.
No. 177. Company E: Jaundice, August 25; sent to division hospital August 28. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 1.
No. 178. Company I: Without date or diagnosis; sent to division hospital August 26, and transferred to Sternberg Hospital August 30. Here the disease was diagnosed typhoid fever. Further disposition of this patient is not given.
No. 179. Company B: Without date or diagnosis; sent to division hospital August 26. Here a diagnosis of undetermined fever was recorded, and the patient was furloughed September 1.
No. 180. Company E: Intermittent malaria, August 26; still sick September 30.
No. 181. Company E: Without date or diagnosis; sent to division hospital August 26. Here a diagnosis of undetermined fever was recorded, and the patient was furloughed September 1.
No. 182. Company C: Intermittent malaria, August 27; sent to division hospital August 28. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 28.
No. 183. Company L: Remittent malaria, August 27; sent to division hospital August 27. Here the diagnosis was changed to continued fever, and the patient remained sick in hospital September 30.
No. 184. Company M: Intermittent malaria, August 27; sent to Sternberg Hospital September 3. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 7.
No. 185. Company M: Jaundice, August 27; sent to Sternberg Hospital without date. Here the diagnosis was changed to typhoid fever. The further disposition of this patient is not given.
No. 186. Company L: Intermittent malaria, August 28; sent to Sternberg Hospital September 4. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 8.
No. 187. Company E: Intermittent malaria, August 28; sent to Sternberg Hospital September 3. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 10.
No. 188. Company D: Without date or diagnosis; sent to division hospital August 28, and transferred to Leiter Hospital September 3. Here the disease was diagnosed intermittent malaria, and the patient was furloughed September 8.
No. 189. Company H: Continued fever, August 28; sent to divi-

sion hospital August 28. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 7.

No. 190. Company D: Remittent malaria, August 28; still sick September 30.

No. 191. Company I: Intermittent malaria, August 29; sent to Sternberg Hospital September 3. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 8.

No. 192. Company K: Intermittent malaria, August 29; still sick September 30.

No. 193. Company I: Intermittent malaria, August 29; sent to Sternberg Hospital September 3. Here the diagnosis was changed to remittent malaria, and the patient was furloughed September 26.

No. 194. Company F: Intermittent malaria, August 29; sent to division hospital August 30. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 28.

No. 195. Company F: Intermittent malaria, August 29; still sick in division hospital September 30.

No. 196. Company B: Without date or diagnosis; sent to division hospital August 30. Here the disease was diagnosed remittent malaria, and the patient remained sick in hospital September 30.

No. 197. Company L: Without date or diagnosis; sent to division hospital August 30, and transferred to Leiter Hospital September 3. Here the disease was diagnosed remittent malaria, and the patient was furloughed October 14.

No. 198. Company D: Without date or diagnosis; sent to Sternberg Hospital August 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 16.

No. 199. Company B: Without date or diagnosis; sent to division hospital August 31, and transferred to Leiter Hospital September 3. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.

No. 200. Company M: Intermittent malaria, August 31; sent to Sternberg Hospital September 3. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 16.

No. 201. Company M: Without date or diagnosis; sent to Sternberg Hospital August 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 17.

No. 202. Company F: Without date or diagnosis; sent to Sternberg Hospital August 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 3.

No. 203. Company H: Jaundice, August 31; sent to Sternberg Hospital September 1. Here the diagnosis was changed to continued malaria, and the patient was furloughed September 10.

No. 204. Company L: Without date or diagnosis; sent to division hospital September 1. Here the diagnosis is recorded as undetermined fever, and the patient remained sick in hospital September 30.

No. 205. Company B: Intermittent malaria, September 1; still sick September 30.

No. 206. Company G: Without date or diagnosis; sent to division hospital September 2. The disease was here diagnosed remittent malaria, and the patient was transferred to Leiter Hospital September 3. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 8.

No. 207. Company K: Without date or diagnosis; sent to Sternberg Hospital September 3. Here the disease was diagnosed typhoid fever, and the patient died September 16.

No. 208. Company G: Without date or diagnosis; sent to Sternberg Hospital September 3. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 9.

No. 209. Company K: Without date or diagnosis; sent to Sternberg Hospital September 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 210. Company I: Intermittent malaria, September 3; sent to Sternberg Hospital September 4. Here the diagnosis is recorded as malaria, and the patient was furloughed September 10.

No. 211. Company E: Without date or diagnosis; sent to Sternberg Hospital September 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 7.

No. 212. Company E: Intermittent malaria, September 3; sent to Sternberg Hospital September 4. Here the diagnosis was changed to typhoid fever, and the patient was furloughed September 7.

No. 213. Company F: Without date or diagnosis; sent to Leiter Hospital September 3. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 23.

No. 214. Company M: Intermittent malaria, September 3; still sick September 30.

No. 215. Company L: Intermittent malaria, September 4; still sick September 30.

No. 216. Company D: Intermittent malaria, September 5; still sick September 30.

No. 217. Company D: Without date or diagnosis; sent to Sternberg Hospital September 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 20.

No. 218. Company I: Without date or diagnosis; sent to Sternberg Hospital September 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 8.

No. 219. Company K: Intermittent malaria; September 6; sent to Sternberg Hospital September 7. Here the diagnosis was changed to typhoid fever, and the patient was furloughed October 3.

No. 220. Company K: Intermittent malaria, September 6; sent to Sternberg Hospital without date. Here the diagnosis was changed to typhoid fever. The further disposition of this patient is not given.

No. 221. Company E: Typhoid fever September 7; died September 19.

No. 222. Company B: Without date or diagnosis; sent to Sternberg Hospital September 7. Here the disease was diagnosed continued malaria, and the patient was furloughed September 26.

No. 223. Company M: Typhoid fever, September 7; furloughed October 10.

No. 224. Company L: Without date or diagnosis; sent to Sternberg Hospital September 9. Here the diagnosis was changed to typhoid fever, and the patient was furloughed November 5.

No. 225. Company M: Typhoid fever, September 11; sent to Sternberg Hospital without date. This name does not occur on the records of Sternberg Hospital.

No. 226. Company K: Typhoid fever, September 12; disposition not given.

No. 227. Company K: Typhoid fever, September 15; disposition not given.

No. 228. Company M: Without date or diagnosis; sent to Sternberg Hospital October 22. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 28. It must be understood that October 22 is not the initial date of this case. On the records of Sternberg Hospital it appears that this patient was transferred to this hospital from Leiter Hospital, but the name can not be found on the records of Leiter Hospital.

SUMMARY.

Assembled near Little Rock, Ark., during April and May, 1898.

Mustered into United States service May 19, 1898.

Arrived at Chickamauga Park, Ga., May 27, 1898.

Strength on arrival, 1,190.

Date of first case of probable typhoid fever, June 2, 1898.

Date of first case of recognized typhoid fever, June 3, 1898.

Left Chickamauga Park, Ga., September 8, 1898.

Strength on departure, 1,290.

Number of cases of probable typhoid fever developed at Chickamauga	224
Number of cases of probable typhoid fever developed after leaving Chickamauga	4

Total number of cases of probable typhoid fever developed in the First Arkansas Volunteer Infantry from May to September, 1898. 228

These 228 cases were diagnosed as follows:

Typhoid fever.....	83
Malaria.....	92
Continued fever.....	18
Dysentery.....	19
Diarrhea.....	9
Undetermined fever.....	6
Undiagnosed.....	1
Total.....	228

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Allison, A. W.....	Pvt., A.	Aug. 29	Moulton, Tex.....	Typhoid.
Anderson, T. H.....	Pvt., K.	July 9	Leiter Hospital, Ga.....	Do.
Bailey, S. M.....	Pvt., L.	Aug. 7	Chickamauga, Ga.....	Do.
Beard, B. H.....	Pvt., M.	Aug. 28	Do.....	Do.
Burbanks, Carlisle.....	Pvt., G.	July 21	Camp Thomas, Ga.....	Heart failure with typhoid.
Denson, M. J.....	Pvt., A.	Sept. 3	Leiter General Hospital, Ga.....	Typhoid.
Dickerson, J. L.....	Pvt., K.	Sept. 16	Do.....	Tobacco-narcotism.
Foster, Frank R.....	Pvt., C.	Oct. 8	Fort Logan, Ark.....	Typhoid.
Fox, Henry.....	Pvt., L.	Sept. 5	Texarkana, Tex.....	(Typhoid); continued fever.
Gateley, Henry.....	Pvt., C.	Aug. 8	Second Division hospital, Third Army Corps.	
Hall, Thomas M.....	Corpl., H.	Sept. 6	Arkadelphia, Ark.....	Typhoid while on sick furlough.
Lockie, A.....	Pvt., K.	Aug. 27	Do.....	Typhoid.
Mayo, C. H.....	Pvt., I.	July 15	Camp Thomas, Ga.....	Do.
Niger, John.....	Pvt., D.	July 21	Do.....	Do.
Quielt, R. C.....	Pvt., E.	Sept. 18	Fort Logan, Ark.....	Do.
Reynolds, J. M.....	Pvt., C.	Aug. 22	Camp Thomas, Ga.....	(Typhoid); spinal meningitis.
Simpson, W. C.....	Pvt., E.	Aug. 30	Do.....	Typhoid.
Sims, John W.....	Pvt., E.	July 16	Do.....	Pneumonia and measles.
Strinklind, J. L.....	Sgt., F.	Oct. 4	Fayetteville, Ark.....	Typhoid.
Tisdale, F. S.....	Pvt., I.	Dec. 22	Camp Shipp, Ala.....	Croupous pneumonia.
Vollman, Ivan D.....	Corpl., B.	Sept. 9	Chickamauga, Ga.....	Typhoid.
White, W. M.....	Pvt., C.	June 23	Do.....	Cerebro-spinal meningitis.
Whiteside, W. C.....	Pvt., E.	Sept. 8	Ozan, Ark.....	Typhoid.
Total deaths.....				23
Deaths due to typhoid fever.....				19

Percentage of deaths among probable cases of typhoid fever (228), 8.33.

Percentage of deaths among recognized cases of typhoid fever (83), 22.89.

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST ARKANSAS VOLUNTEER INFANTRY.

Medical officers.

James C. Minor, major and surgeon, Hot Springs, Ark.
Eugene C. Hay, lieutenant and assistant surgeon, Hot Springs, Ark.
Clint P. Merriwether, lieutenant and assistant surgeon, Walnut Ridge, Ark.

Major Minor states:

The camp at Little Rock was on high, rolling ground with porous soil. The water supply was obtained from the city pipes, which had been carried through the encampment. There were no cases of typhoid fever in the neighborhood of the camp and none among the troops during their stay at this place.

The location of the camp in Chickamauga Park was unfortunate, being too close to other regiments and shaded too densely. The water supply was at all times bountiful, but doubtful as to quality, being hauled from springs in barrels not properly cared for.

Major Minor thinks that we have greatly exaggerated the number of cases of probable typhoid fever in his regiment.

FIFTH MISSOURI VOLUNTEER INFANTRY.

Second Brigade, Second Division, Third Army Corps.

The first report from this regiment covers the period from May 18 to May 31, inclusive. The regiment was under the care of Major Howelson, who makes the following statement:

The regiment left Jefferson Barracks May 25 for Chickamauga Park, Ga., arriving at the latter place May 27. The sanitary conditions at Chickamauga are good. Pneumonia, malaria, mumps, and acute diarrhea have been the prevailing diseases.

CONDENSED SICK REPORT FROM MAY 18 TO MAY 31.

Mean strength.....	1,024
Acute diarrhea.....	10
Intermittent malaria.....	2
Other diseases.....	15
Total.....	27

In the June report Major Howelson states that malaria, indigestion, and acute diarrhea were the prevailing diseases.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,053
Diarrhea.....	111
Enterocolitis.....	1
Intermittent malaria.....	60
Indigestion.....	1
Malaria.....	1
Other diseases.....	67
Total.....	241

In the July report Major Howelson states:

The prevailing diseases were intermittent malarial fever, typhoid fever, and diarrhea. Water from surface wells seems to be the exciting cause of the prevailing diseases, together with peculiar formation of the ground (hardpan) in this location, which retains the sewage. The sinks become putrefied and breed disease.

CONDENSED SICK REPORT FOR JULY.

Mean strength.....	1,313
Diarrhea.....	41
Intermittent malaria.....	79
Remittent malaria.....	10
Dysentery.....	1
Typhoid fever.....	6
Other diseases.....	54
Total.....	191

In the August report Major Howelson states that the regiment left Chickamauga Park for Lexington, Ky., August 27.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength.....	1,299
Typhoid fever.....	10
Intermittent malaria.....	285
Remittent malaria.....	2
Diarrhea.....	50
Indigestion.....	2
Other diseases.....	75
Total.....	424

The September report is signed by First Asst. Surg. F. M. McCallum, who makes the following statement:

The prevailing diseases were malaria and typhoid fever. The usual means for preventing such diseases were adopted. The regiment remained at Camp Hamilton, Ky., from September 1 to September 6. It was in transit from Camp Hamilton, Ky., to Kansas City, Mo., from September 6 to September 16.

The regiment was furloughed September 16 for thirty days, a detail of 150 men being left in camp to guard property. All the sick were sent to the various hospitals in Kansas City and were under the care of Contract Surgeon Coffin.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength.....	1,207
Intermittent malaria.....	28
Diarrhea.....	6
Typhoid fever.....	22
Gastritis.....	2
Dysentery.....	1
Other diseases.....	22
Total.....	81

The October report is also signed by Surgeon McCallum, who makes the following statement:

The prevailing diseases were typhoid fever with a few cases of malarial fever, most of the typhoid cases developing since returning from Chickamauga Park, Ga. But few cases were treated in quarters, most all cases being sent to the various hospitals in Kansas City, Mo., and treated by S. Coffin, contract surgeon. On the 19th day of September the regiment was moved into an old building in Kansas City, Mo., on account of the stormy weather; distance traveled, 8 miles.

In explanation of the statement made in the above quotation, it should be stated that when the regiment returned from Lexington, Ky., the detail left after furlough was in camp at Camp Sanger and Camp Compton, near Kansas City, Mo.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength.....	1,298
Malaria.....	2
Intermittent malaria.....	13
Typhoid fever.....	22
Gastro-enteritis.....	3
Diarrhea.....	2
Gastritis.....	2
Dysentery.....	1
Other diseases.....	55
Total.....	100

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

- No. 1. Company C: Diarrhea, June 6; sent to division hospital June 17. There is no further record of this case.
- No. 2. Company L: Diarrhea, June 8; still sick June 30.
- No. 3. Company E: Diarrhea, June 8 to 19.
- No. 4. Company H: Diarrhea, June 10; furloughed from division hospital July 1.
- No. 5. Company K: Intermittent malaria, June 10; furloughed June 22.
- No. 6. Company H: Diarrhea, June 11; furloughed July 1.
- No. 7. Company L: Diarrhea, June 11 to 23.
- No. 8. Company E: Intermittent malaria, June 18 to July 17.
- No. 9. Hospital corps: Intermittent malaria, June 21; still sick in Leiter Hospital July 31.
- No. 10. Company K: Intermittent malaria, June 26 to July 10.
- No. 11. Company M: Debility and diarrhea, June 26; still sick at Fort McPherson July 31.
- No. 12. Company K: Diarrhea, June 27 to July 7.
- No. 13. Company E: Diarrhea, June 29 to July 13.
- No. 14. Company B: Typhoid fever, July 2; furloughed July 15.
- No. 15. Company D: Dysentery, July 2; furloughed July 26.
- No. 16. Company A: Diarrhea, July 2 to 28.
- No. 17. Company C: Intermittent malaria, July 6 to 29.
- No. 18. Company I: Intermittent malaria, July 8; furloughed August 14.
- No. 19. Company E: Intermittent malaria, July 9 to 30.
- No. 20. Company G: Typhoid fever, July 9; sent to Fort McPherson July 25.
- No. 21. Company M: Diarrhea, July 10 to 31.
- No. 22. Company C: Typhoid fever, July 11; died in hospital July 29.
- No. 23. Company A: Typhoid fever, July 11; died in division hospital July 20.
- No. 24. Company E: Remittent malaria, July 12; furloughed from division hospital August 20.
- No. 25. Company C: Remittent malaria, July 12; furloughed from division hospital July 25.
- No. 26. Company I: Intermittent malaria, July 14; furloughed from division hospital August 1.
- No. 27. Company L: Intermittent malaria, July 16; furloughed from division hospital August 26.
- No. 28. Company I: Typhoid fever, July 21; furloughed from Leiter Hospital September 11.
- No. 29. Company B: Intermittent malaria, July 22; furloughed from division hospital August 20.
- No. 30. Company H: Intermittent malaria, July 22 to August 15.
- No. 31. Company B: Typhoid fever, July 24; furloughed from division hospital August 30.
- No. 32. Company C: Intermittent malaria, July 24 to August 11.
- No. 33. Company A: Typhoid fever, July 25; still sick in division hospital August 31.
- No. 34. Company C: Intermittent malaria, July 26 to September 3.
- No. 35. Company E: Intermittent malaria, July 27; furloughed August 6.
- No. 36. Company H: Intermittent malaria, July 27; furloughed August 15.
- No. 37. Company H: Intermittent malaria, July 27; furloughed August 5.
- No. 38. Company G: Intermittent malaria, July 29; furloughed August 23.
- No. 39. Company B: Diarrhea, July 30; furloughed August 27.
- No. 40. Company M: Diarrhea, July 30; furloughed August 10.
- No. 41. Company M: Intermittent malaria, August 1; still sick September 30.
- No. 42. Company A: Intermittent malaria, August 1; still sick September 30.

No. 43. Company D: Intermittent malaria, August 2 to September 26.
 No. 44. Company I: Intermittent malaria, August 3; still sick September 30.
 No. 45. Company E: Intermittent malaria, August 3 to 26.
 No. 46. Company E: Intermittent malaria, August 3; still sick September 30.
 No. 47. Company C: Intermittent malaria, August 4 to 24.
 No. 48. Company C: Intermittent malaria, August 6; still sick September 30.
 No. 49. Company C: Intermittent malaria, August 6; furloughed from division hospital August 23. In the hospital this case was diagnosed typhoid fever.
 No. 50. Company A: Intermittent malaria, August 7; still sick September 30.
 No. 51. Company F: Intermittent malaria, August 8; furloughed from division hospital September 16.
 No. 52. Company I: Intermittent malaria, August 8; furloughed from division hospital August 26.
 No. 53. Company I: Intermittent malaria, August 8; still sick September 30.
 No. 54. Company C: Intermittent malaria, August 9; furloughed August 24.
 No. 55. Company L: Intermittent malaria, August 9; died August 21.
 No. 56. Company F: Intermittent malaria, August 9; furloughed August 26.
 No. 57. Company K: Malaria, August 9; died August 9.
 No. 58. Company B: Intermittent malaria, August 9; furloughed September 16.
 No. 59. Company H: Intermittent malaria, August 9; furloughed August 26.
 No. 60. Company E: Intermittent malaria, August 9; furloughed August 14.
 No. 61. Company M: Intermittent malaria, August 9; furloughed August 20.
 No. 62. Company M: Intermittent malaria, August 9; furloughed August 19.
 No. 63. Company I: Intermittent malaria, August 9; still sick September 30.
 No. 64. Company H: Intermittent malaria, August 9; furloughed August 20.
 No. 65. Company E: Intermittent malaria, August 9; furloughed August 26.
 No. 66. Company F: Intermittent malaria, August 10 to October 28.
 No. 67. Company F: Intermittent malaria, August 10; furloughed September 16.
 No. 68. Company F: Intermittent malaria, August 11; still sick September 30.
 No. 69. Company I: Intermittent malaria, August 11; furloughed August 26.
 No. 70. Company I: Intermittent malaria, August 11; furloughed from Leiter Hospital September 2. In the hospital this case was diagnosed typhoid fever.
 No. 71. Company K: Intermittent malaria, August 11; furloughed August 26.
 No. 72. Company M: Intermittent malaria, August 11; furloughed August 26.
 No. 73. Company E: Intermittent malaria, August 11; furloughed August 22.
 No. 74. Company H: Intermittent malaria, August 11; still sick September 30.
 No. 75. Company H: Intermittent malaria, August 11; furloughed August 26.
 No. 76. Company L: Intermittent malaria, August 11; still sick October 17.
 No. 77. Company H: Intermittent malaria, August 11; still sick in Sternberg Hospital September 30.

No. 78. Company G: Intermittent malaria, August 12; furloughed August 26.
 No. 79. Company D: Intermittent malaria, August 12; furloughed August 26.
 No. 80. Band: Intermittent malaria, August 13; furloughed August 26.
 No. 81. Band: Intermittent malaria, August 13; furloughed September 3.
 No. 82. Company B: Intermittent malaria, August 13; furloughed September 16.
 No. 83. Company L: Intermittent malaria, August 13; furloughed August 26.
 No. 84. Company B: Intermittent malaria, August 13; furloughed September 16.
 No. 85. Company K: Diarrhea, August 13; still sick September 30.
 No. 86. Company M: Intermittent malaria, August 13; still sick September 30.
 No. 87. Company G: Intermittent malaria, August 13; furloughed September 16.
 No. 88. Company F: Intermittent malaria, August 14; furloughed September 16.
 No. 89. Company K: Intermittent malaria, August 14; furloughed August 26.
 No. 90. Company L: Typhoid fever, August 14; furloughed August 26.
 No. 91. Company F: Intermittent malaria, August 14; furloughed September 16.
 No. 92. Company M: Intermittent malaria, August 14; furloughed August 26.
 No. 93. Company L: Intermittent malaria, August 14; furloughed September 16.
 No. 94. Company F: Intermittent malaria, August 14; furloughed August 25.
 No. 95. Company D: Intermittent malaria, August 15; furloughed August 26.
 No. 96. Company I: Intermittent malaria, August 15; still sick September 30.
 No. 97. Company I: Intermittent malaria, August 15; still sick September 30.
 No. 98. Company B: Intermittent malaria, August 15; still sick September 30.
 No. 99. Company H: Intermittent malaria, August 15; still sick September 30.
 No. 100. Company G: Typhoid fever, August 15; still sick September 30.
 No. 101. Company M: Typhoid fever, August 15; furloughed August 20.
 No. 102. Company L: Intermittent malaria, August 15; still sick September 30.
 No. 103. Company I: Intermittent malaria, August 15; still sick September 30.
 No. 104. Company H: Intermittent malaria, August 15; still sick September 30.
 No. 105. Company E: Intermittent malaria, August 16; still sick September 30.
 No. 106. Company G: Intermittent malaria, August 16; furloughed August 27.
 No. 107. Company D: Intermittent malaria, August 16; furloughed from Leiter Hospital September 21.
 No. 108. Company C: Intermittent malaria, August 16; still sick September 30.
 No. 109. Company H: Intermittent malaria, August 16; still sick September 30.
 No. 110. Company F: Intermittent malaria, August 16; still sick September 30.
 No. 111. Company F: Intermittent malaria, August 16 to September 4.
 No. 112. Company E: Intermittent malaria, August 16; died in

Sternberg Hospital August 31. In the hospital this case was diagnosed typhoid fever.

No. 113. Company M: Intermittent malaria, August 16; furloughed August 26.

No. 114. Company K: Typhoid fever, August 17; died in St. Vincent's Hospital at Chattanooga August 21.

No. 115. Company D: Intermittent malaria, August 17; still sick September 30.

No. 116. Company D: Intermittent malaria, August 17; still sick September 30.

No. 117. Company F: Intermittent malaria, August 18; still sick September 30.

No. 118. Company E: Intermittent malaria, August 18; still sick September 30.

No. 119. Company D: Diarrhea, August 18; still sick September 30.

No. 120. Company K: Intermittent malaria, August 18; still sick September 30.

No. 121. Company F: Intermittent malaria, August 18; still sick September 30.

No. 122. Company I: Diarrhea, August 18; still sick September 30.

No. 123. Company K: Intermittent malaria, August 18; furloughed September 16.

No. 124. Company L: Intermittent malaria, August 18; furloughed September 16.

No. 125. Company E: Intermittent malaria, August 18; furloughed August 26.

No. 126. Company F: Intermittent malaria, August 18; still sick September 30.

No. 127. Company K: Typhoid fever, August 19; still sick September 30.

No. 128. Company I: Intermittent malaria, August 19; still sick September 30.

No. 129. Company A: Diarrhea, August 19; still sick September 30.

No. 130. Company H: Intermittent malaria, August 19; still sick September 30.

No. 131. Company B: Intermittent malaria, August 20; still sick September 30.

No. 132. Company C: Intermittent malaria, August 20 to October 18.

No. 133. Company F: Typhoid fever, August 20; died at home on furlough August 30.

No. 134. Company E: Intermittent malaria, August 20; still sick September 30.

No. 135. Company I: Intermittent malaria, August 20; furloughed September 16.

No. 136. Company M: Intermittent malaria, August 20; still sick September 30.

No. 137. Company E: Intermittent malaria, August 21; still sick September 30.

No. 138. Company L: Intermittent malaria, August 21; still sick September 30.

No. 139. Company E: Intermittent malaria, August 21; still sick September 30.

No. 140. Company E: Intermittent malaria, August 21; still sick September 30.

No. 141. Company E: Intermittent malaria, August 22; still sick September 30.

No. 142. Company C: Intermittent malaria, August 22; still sick September 30.

No. 143. Company G: Typhoid fever, August 22; still sick September 30.

No. 144. Company C: Typhoid fever, August 22; still sick September 30.

No. 145. Company E: Intermittent malaria, August 23; still sick September 30.

No. 146. Company L: Intermittent malaria, August 23; still sick September 30.

No. 147. Company H: Intermittent malaria, August 24; still sick September 30.

No. 148. Company E: Intermittent malaria, August 24 to November 7. In the hospital this case was diagnosed typhoid fever.

No. 149. Company I: Intermittent malaria, August 24; furloughed September 16.

No. 150. Company A: Diarrhea, August 24; still sick September 30.

No. 151. Company A: Intermittent malaria, August 25; still sick September 30.

No. 152. Company I: Intermittent malaria, August 25; still sick September 30.

No. 153. Company A: Intermittent malaria, August 25; still sick September 30.

No. 154. Company H: Intermittent malaria, August 28; furloughed from hospital September 25. In the hospital this case was diagnosed typhoid fever.

No. 155. Company G: Intermittent malaria, August 28; furloughed from hospital October 19. In the hospital this case was diagnosed typhoid fever.

No. 156. Company C: Intermittent malaria, August 29; furloughed September 16.

No. 157. Company H: Intermittent malaria, August 29; still sick September 30.

No. 158. Company I: Intermittent malaria, August 29; furloughed September 16.

No. 159. Company L: Intermittent malaria, August 29; furloughed September 16.

No. 160. Company H: Intermittent malaria, August 29; still sick September 30.

No. 161. Company L: Intermittent malaria, August 29; still sick September 30.

No. 162. Company D: Intermittent malaria, August 29; still sick September 30.

No. 163. Company D: Intermittent malaria, August 29; furloughed September 16.

No. 164. Company E: Intermittent malaria, August 30; still sick September 30.

No. 165. Company E: Diarrhea, August 30; still sick September 30.

No. 166. Company E: Intermittent malaria, August 30; still sick September 30.

No. 167. Company H: Diarrhea, August 30; still sick September 30.

No. 168. Company I: Intermittent malaria, August 31; still sick October 22.

No. 169. Company F: Intermittent malaria, September 3; still sick September 30.

No. 170. Company C: Typhoid fever, September 8; furloughed September 25.

No. 171. Company C: Typhoid fever, September 8; sent to St. Joseph's Hospital September 30.

No. 172. Company not given: Typhoid fever, September 8; sent to St. Joseph's Hospital September 30.

No. 173. Company D: Typhoid fever, September 8; sent to St. Joseph's Hospital September 30.

No. 174. Company E: Typhoid fever, September 9; disposition not given.

No. 175. Company M: Typhoid fever, September 9; sent to St. Joseph's Hospital September 30.

No. 176. Company D: Typhoid fever, September 9; sick in German Hospital September 30.

No. 177. Company H: Typhoid fever, September 10; still sick in St. Joseph's Hospital September 30.

No. 178. Company H: Intermittent malaria, September 10; still sick November 30.

No. 179. Company A: Typhoid fever, September 10; still sick in St. Joseph's Hospital September 30.

No. 180. Company not given: Typhoid fever, September 10 to October 19.

No. 181. Hospital Corps: Typhoid fever, September 11; still sick November 5.

No. 182. Company D: Typhoid fever, September 11; still sick in St. Agnes' Hospital September 30.

No. 183. Company A: Dysentery, September 11 to November 9.

No. 184. Company I: Typhoid fever, September 14; still sick in St. Joseph's Hospital September 30.

No. 185. Company M: Typhoid fever, September 14 to October 26.

No. 186. Company A: Typhoid fever, September 14; still sick in St. Joseph's Hospital September 30.

No. 187. Company A: Typhoid fever, September 15; still sick in St. Joseph's Hospital September 30.

No. 188. Company A: Typhoid fever, September 15; still sick in St. Joseph's Hospital September 30.

No. 189. Company B: Typhoid fever, September 17; still sick in St. Joseph's Hospital September 30.

No. 190. Company D: Typhoid fever, September 18; still sick in St. Joseph's Hospital September 30.

No. 191. Company A: Typhoid fever, September 19; still sick in St. Joseph's Hospital September 30.

No. 192. Company C: Typhoid fever, September 19; still sick in St. Joseph's Hospital September 30.

No. 193. Company F: Typhoid fever, September 20; furloughed November 3.

No. 194. Company M: Typhoid fever, September 20; still sick in St. Joseph's Hospital September 30.

No. 195. Company F: Diarrhea, September 20 to October 13.

No. 196. Company F: Gastro-duodenitis, September 22 to November 3.

No. 197. Company H: Typhoid fever, September 29; died September 30.

No. 198. Company D: Diarrhea, October 1 to 11.

No. 199. Company F: Gastro-duodenitis, October 9 to November 2.

No. 200. Company M: Gastro-enteritis, October 11; still sick October 31.

No. 201. Company G: Typhoid fever, October 16; disposition not given.

No. 202. Company A: Typhoid fever, October 16; disposition not given.

No. 203. Company F: Intermittent malaria, October 17 to November 30.

No. 204. Company E: Typhoid fever, October 17; furloughed November 5.

No. 205. Company E: Intermittent malaria, October 17 to November 4.

No. 206. Company E: Gastro-duodenitis, October 17 to November 2.

No. 207. Company A: Typhoid fever, October 18; disposition not given.

No. 208. Company E: Intermittent malaria, October 19; still sick October 31.

No. 209. Company A: Typhoid fever, October 23; disposition not given.

No. 210. Company H: Typhoid fever, October 24; disposition not given.

No. 211. Company A: Intermittent malaria, October 25; disposition not given.

No. 212. Company B: Intermittent malaria, October 29; disposition not given.

SUMMARY.

Assembled at Jefferson Barracks, near St. Louis, Mo., during April and May, 1898.

Mustered into United States service May 18, 1898.

Arrived at Chickamauga Park, Ga., May 27, 1898.

Strength on arrival, 1,024.

Date of first case of probable typhoid fever, June 6, 1898.

Date of first case of recognized typhoid fever, July 2, 1898.

Left Chickamauga Park, Ga., August 27, 1898.

Strength on departure, 1,274.

Number of cases of probable typhoid fever developed at Chickamauga 153

Arrived at Lexington, Ky., August 28, 1898.

Left Lexington, Ky., September 6, 1898.

Went from Lexington, Ky., to Kansas City, Mo.

Furloughed September 16, 1898.

Number of cases of probable typhoid fever developed after leaving Chickamauga 59

Total number of cases of probable typhoid fever developed in the Fifth Missouri Volunteer Infantry from May to October, 1898 212

These 212 cases were diagnosed as follows:

Typhoid fever.....	51
Malaria.....	133
Diarrhea.....	21
Debility.....	1
Dysentery.....	2
Gastro-duodenitis.....	3
Gastro-enteritis.....	1
Total.....	212

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Belk, Fred B.....	Pvt., L	1898 Aug. 21	Camp Thomas, Ga.....	Typhoid.
Carse, Thomas R.....	Qmsgt., K	Sept. 26	Wellington, Mo.....	Do.
Clements, Charles B.....	Pvt., E	June 21	Chickamauga, Ga.....	Spinal meningitis.
Craig, Fred L.....	Pvt., C	July 29	Camp Thomas, Ga.....	Typhoid.
Doonan, Claude.....	Pvt., A	July 20	Chickamauga, Ga.....	Do.
Eaton, Clarence A.....	Pvt., K	Aug. 9	do.....	Do.
Elling, Martin E.....	Corpl., K	Aug. 22	Chattanooga, Tenn.....	Do.
Heimsath, Henry J.....	Pvt., A	Sept. 30	Kansas City, Mo.....	Do.
Holbs, Emery G.....	Pvt., F	June —	St. Louis, Mo.....	Do.
McCarthy, John C.....	Pvt., C	Sept. 11	Kansas City, Mo.....	Do.
McElwee, John.....	Pvt., M	Aug. 20	Excelsior Springs, Mo.	Abcess of brain.
Mason, Richard W.....	Pvt., L	May 30	St. Louis, Mo.....	(Typhoid); intermittent malarial fever tertian.
Ray, Leopold.....	Pvt., M	July 28	do.....	Typhoid.
Scott, Harley W.....	Pvt., E	Sept. 15	Pleasant Hill, Mo.....	Do.
Sexaner, Fred.....	Pvt., K	Sept. 20	Hermion, Mo.....	Do.
Tumbleson, James O.....	Corpl., E	Aug. 17	Chickamauga, Ga.....	Do.

Total deaths..... 16
Deaths due to typhoid fever 14

Percentage of deaths among probable cases (212) of typhoid fever, 6.60.
Percentage of deaths among recognized cases of typhoid fever (51), 27.45.

SECOND ARKANSAS VOLUNTEER INFANTRY.

Second Brigade, Second Division, Third Army Corps.

In the May report Major Orto makes the following statement:

There are no data from which to compile a report prior to June 1. The regiment was mustered into service May 27, 1898, at Camp Dodge, Little Rock, Ark. It was en route from Camp Dodge to Chickamauga Park May 29 and 30. The camp at Little Rock, Ark., where the regiment was mustered into service, was in part in charge of Doctor Cantrell. The present major surgeon was not at any time in charge, he having been kept on duty at the State hos-

pital examining recruits until orders for transfer to Chickamauga Park were received. From the time of muster in until the time of arrival here at the end of the month there were no cases of a serious nature and no duty which required anyone to be excused.

The mean strength is given at 1,029.

In the June report Major Orto makes the following statement:

Cases constituting the sickness in the Second Arkansas Volunteer Infantry are as follows:

	Per cent.
Vaccinia	46.89
Malaria	11.04
Diarrhea	11.02
All other cases	31.05

The regiment was vaccinated about ten days before it left Camp Dodge for this place. En route the men ate dainties and drank freely of beer and whisky given to them by their friends. Their arms sustained many injuries from their own good-natured pushing and unnecessary crowding. Their arms were treated as nearly antiseptically as circumstances and condition of medical supplies would admit.

The presence of malarial fever is due to former residence in malarial districts, manifesting itself on moving to higher altitude and change of air and water. The presence of diarrhea is due to the ignorance of raw soldiers in preparing food and lack of knowledge of personal care. They have been given instructions in such matters during the month. The changes made by gains and losses are as follows:

Gained:

June 19, enlisted men	41
June 18, chaplain	1
June 24, enlisted men	29
June 28, enlisted men	83
June 30, enlisted men	41
Total	195

Lost:

June 30, died	1
June 10, discharged	1
June 30, transferred to division hospital	30
Total	32

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,009
Intermittent malaria	35
Remittent malaria	76
Acute diarrhea	103
Dysentery	10
Typhoid fever	3
Pernicious malaria	1
Other diseases	494
Total	722

In the July report Major Orto states:

The prevailing diseases are measles, typhoid fever, malarial fever, diarrhea, and mild bronchitis. The cases of measles have been isolated. The malarial and typhoid fevers are due to local causes not easily removed. I would recommend that water be boiled and filtered before drinking, but at present we have no containers, neither barrels nor buckets to cool the water, nor have we kettles to boil it in.

The Third Battalion, composed of Companies I, K, L, and M, was detached on July 20 and returned on July 27. This regiment was on target practice, in charge of Lieut. H. Willis. His report is transmitted separately.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,323
Intermittent malaria	296
Remittent malaria	79
Acute diarrhea	187
Dysentery	17
Typhoid fever	9
Other diseases	127
Total	715

Condensed sick report of the Third Battalion of the Second Arkansas Volunteer Infantry at Target Camp, Chickamauga Park, Ga., for the month of July, 1898.

Strength of this command is not given.

Intermittent malaria	10
Remittent malaria	2
Acute diarrhea	10
Dysentery	1
Typhoid fever	9
Other diseases	23
Total	55

In the August report Lieut. H. Willis, in charge of the regiment, makes the following statement:

The prevailing diseases for the month were malaria, measles, acute diarrhea, typhoid fever, and hepatic torpor. Measles were invariably isolated from camp, but the battalion left for target practice were rained upon and exposed, and measles appeared. Water is now boiled in this regiment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,335
Intermittent malaria	240
Remittent malaria	111
Acute diarrhea	154
Dysentery	18
Typhoid fever	15
Other diseases	60
Total	598

This regiment remained at Chickamauga Park, Ga., until September 9, when it left for Anniston, Ala.

The September report is signed by Lieutenant Willis without comment.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,282
Intermittent malaria	109
Remittent malaria	167
Acute diarrhea	79
Dysentery	9
Typhoid fever	8
Other diseases	135
Total	507

The October report is signed by Lieutenant King, who makes the following statement:

The health of the regiment has been rapidly improving since the date of its arrival at Camp Shipp. The prevailing diseases have been jaundice and malarial fever, remittent and intermittent. The cause of the jaundice was due chiefly to the fact that the company tents were pitched with no means of heating. Those officers

and enlisted men who occupied heated tents have entirely escaped this complaint. Only two cases of typhoid fever have developed since the encampment of this regiment at Anniston, the infection of which was no doubt received from some source other than our water supply. I believe that the typhoid fever of Camp Shipp can be traced to one very old spring near the city of Anniston. The regimental hospital of this regiment has been almost fully equipped.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,251
Intermittent malaria	26
Remittent malaria	149
Acute diarrhea	38
Dysentery	3
Typhoid fever	3
Total	219

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

- No. 1. Company D: Intermittent malaria, June 4 to 18.
- No. 2. Company L: Intermittent malaria, June 8; still sick in Leiter Hospital July 31.
- No. 3. Company F: Malaria, June 11; still sick in division hospital July 31.
- No. 4. Company E: Remittent malaria, June 11; furloughed from Leiter Hospital July 11.
- No. 5. Company B: Remittent malaria, June 12; still sick July 31.
- No. 6. Company L: Dysentery, June 12 to August 20.
- No. 7. Company B: Remittent malaria, June 15 to July 25.
- No. 8. Company E: Malaria, June 15; still sick in division hospital July 31. In hospital this case was diagnosed typhoid fever.
- No. 9. Company E: Intermittent malaria, June 15; furloughed from division hospital August 1.
- No. 10. Company I: Remittent malaria, June 16 to 28.
- No. 11. Company C: Remittent malaria, June 17; died in division hospital June 30.
- No. 12. Company G: Diarrhea, June 18 to July 20.
- No. 13. Company G: Dysentery, June 18 to July 27.
- No. 14. Company E: Diarrhea, June 18 to July 7.
- No. 15. Company F: Typhoid fever, June 20; died in division hospital July 22.
- No. 16. Company F: Remittent malaria, June 20; furloughed from Sternberg Hospital September 23. In hospital this case was diagnosed typhoid fever.
- No. 17. Company B: Remittent malaria, June 20; furloughed June 30.
- No. 18. Company D: Remittent malaria, June 20 to July 9.
- No. 19. Company L: Remittent malaria, June 21; furloughed from Leiter Hospital July 27.
- No. 20. Company G: Remittent malaria, June 21; still sick in division hospital July 31.
- No. 21. Company H: Intermittent malaria, June 22 to July 5.
- No. 22. Company B: Diarrhea, June 23; still sick July 31.
- No. 23. Company E: Without date or diagnosis; sent to Leiter Hospital June 23. Here the disease was diagnosed typhoid fever, and the patient was furloughed July 21.
- No. 24. Company E: Remittent malaria, June 24; still sick in division hospital July 31.
- No. 25. Company E: Remittent malaria, June 24; still sick in division hospital July 31.
- No. 26. Company H: Remittent malaria, June 24; still sick in division hospital July 31.
- No. 27. Company D: Remittent malaria, June 24; still sick in division hospital July 31.
- No. 28. Company E: Typhoid fever, June 25; furloughed from Leiter Hospital August 13.

- No. 29. Company E: Diarrhea, June 25; still sick in Leiter Hospital July 31.
- No. 30. Company B: Remittent malaria, June 27 to July 7.
- No. 31. Company K: Remittent malaria, June 28; still sick in division hospital July 31.
- No. 32. Company B: Remittent malaria, June 28 to July 19.
- No. 33. Company B: Remittent malaria, June 29 to July 11.
- No. 34. Company M: Remittent malaria, June 29 to July 25.
- No. 35. Company G: Malaria, June 30 to July 14.
- No. 36. Company H: Malaria, July 1 to 28.
- No. 37. Company L: Diarrhea, July 1 to 12.
- No. 38. Company H: Remittent malaria, July 5 to 26.
- No. 39. Company K: Remittent malaria, July 5; still sick in division hospital July 31.
- No. 40. Company K: Remittent malaria, July 5 to 22.
- No. 41. Company E: Remittent malaria, July 5; still sick in division hospital July 31.
- No. 42. Company B: Diarrhea, July 5 to 16.
- No. 43. Company C: Diarrhea, July 6 to August 6.
- No. 44. Company E: Diarrhea, July 7 to August 22.
- No. 45. Company I: Malaria, July 7 to 17.
- No. 46. Company B: Remittent malaria, July 8 to August 3.
- No. 47. Company C: Malaria, July 10; still sick August 31.
- No. 48. Company C: Malaria, July 10 to August 3.
- No. 49. Company E: Undetermined fever, July 11; still sick in Leiter Hospital July 31. In hospital this case was diagnosed typhoid fever.
- No. 50. Company L: Remittent malaria, July 12 to August 25.
- No. 51. Company C: Remittent malaria, July 13 to August 16.
- No. 52. Company I: Remittent malaria, July 15 to August 24.
- No. 53. Company G: Typhoid fever, July 16; sent to Fort McPherson July 25.
- No. 54. Company I: Remittent malaria, July 17; died in division hospital August 19. In hospital this case was diagnosed typhoid fever.
- No. 55. Company K: Hepatic engorgement, July 18 to August 12.
- No. 56. Company G: Diarrhea, July 18 to August 4.
- No. 57. Company M: Remittent malaria, July 19 to August 1. This man is recorded as having had malaria, July 3 to 5.
- No. 58. Company K: Remittent malaria, July 19 to August 3.
- No. 59. Company E: Remittent malaria, July 19 to August 4.
- No. 60. Company D: Diarrhea, July 20 to August 3.
- No. 61. Company L: Intermittent malaria, July 20; furloughed August 21.
- No. 62. Company G: Remittent malaria, July 20 to August 6.
- No. 63. Company not given: Diarrhea, July 20; still sick in division hospital August 31.
- No. 64. Company B: Intermittent malaria, July 21 to August 24.
- No. 65. Company D: Diarrhea, July 21 to August 3.
- No. 66. Company E: Intermittent malaria, July 21 to August 9.
- No. 67. Company I: Intermittent malaria, July 21 to August 21.
- No. 68. Company D: Intermittent malaria, July 21 to August 24.
- No. 69. Company K: Typhoid fever, July 22 to August 24.
- No. 70. Company H: Intermittent malaria, July 23 to August 4.
- No. 71. Company K: Remittent malaria, July 23 to August 28.
- No. 72. Company G: Intermittent malaria, July 23 to August 4.
- No. 73. Company I: Remittent malaria, July 23 to August 24.
- No. 74. Company D: Typhoid fever, July 23; died in Leiter Hospital July 31.
- No. 75. Company I: Remittent malaria, July 23 to August 28.
- No. 76. Company I: Remittent malaria, July 23; still sick in division hospital August 31.
- No. 77. Company D: Typhoid fever, July 24; disposition not given.
- No. 78. Company B: Remittent malaria, July 25; still sick August 31.
- No. 79. Company F: Remittent malaria, July 25 to August 24.
- No. 80. Company C: Typhoid fever, July 25; sent to Fort McPherson July 25.

- No. 81. Company K: Intermittent malaria, July 25 to August 24.
No. 82. Company C: Remittent malaria, July 25 to August 6.
No. 83. Company G: Typhoid fever, July 25; sent to Fort McPherson July 25.
No. 84. Company I: Intermittent malaria, July 26; still sick in division hospital August 31.
No. 85. Company F: Intermittent malaria, July 27 to August 24.
No. 86. Company D: Typhoid fever, July 28; disposition not given.
No. 87. Company I: Intermittent malaria, July 28; furloughed August 9.
No. 88. Company B: Typhoid fever, July 28; disposition not given.
No. 89. Company E: Typhoid fever, July 28; furloughed from Sternberg Hospital August 26.
No. 90. Company H: Remittent malaria, July 28; still sick in division hospital August 31.
No. 91. Company B: Intermittent malaria, July 26; still sick in division hospital August 31.
No. 92. Company D: Typhoid fever, July 28; still sick August 31.
No. 93. Company G: Intermittent malaria, July 28; still sick in Sternberg Hospital August 31. In hospital this case was diagnosed typhoid fever.
No. 94. Company L: Intermittent malaria, July 28 to August 28. This man is recorded as having had malaria from July 1 to 19.
No. 95. Company C: Typhoid fever, July 29; still sick in division hospital August 31.
No. 96. Company C: Remittent malaria, July 29; still sick in division hospital August 31.
No. 97. Company M: Typhoid fever, July 29; still sick August 31.
No. 98. Company L: Remittent malaria, July 29 to August 23.
No. 99. Company L: Diarrhea, July 30 to August 25.
No. 100. Company B: Diarrhea, July 30; died in division hospital August 17. In hospital this case was diagnosed typhoid fever.
No. 101. Company G: Undetermined fever, July 30 to August 24.
No. 102. Company K: Intermittent malaria, July 30 to August 14.
No. 103. Company E: Typhoid fever, July 30; furloughed from Leiter Hospital October 4.
No. 104. Company K: Intermittent malaria, July 31 to August 18.
No. 105. Company G: Diarrhea, July 31 to August 14.
No. 106. Company not given: Hepatic torpor, July 31 to August 14.
No. 107. Company I: Intermittent malaria, August 1 to 22.
No. 108. Company A: Typhoid fever, August 2; disposition not given.
No. 109. Company M: Typhoid fever, August 3; still sick in division hospital August 31.
No. 110. Company K: Intermittent malaria, August 3; furloughed from Sternberg Hospital September 10. In hospital this case was diagnosed typhoid fever.
No. 111. Company M: Without date or diagnosis; sent to Sternberg Hospital August 3. Here the case was diagnosed typhoid fever, and the patient was furloughed September 26.
No. 112. Company M: Typhoid fever, August 3; furloughed from Sternberg Hospital August 20.
No. 113. Company G: Dysentery, August 4; died in division hospital August 15.
No. 114. Company I: Continued fever, August 4; still sick in division hospital August 31.
No. 115. Company C: Diarrhea, August 5 to 23.
No. 116. Company K: Typhoid fever, August 5; disposition not given.
No. 117. Company M: Typhoid fever, August 5; disposition not given.
No. 118. Company G: Intermittent malaria, August 5 to 17.
No. 119. Company D: Intermittent malaria, August 5; still sick in division hospital August 31.
No. 120. Company G: Typhoid fever, August 5; still sick in division hospital August 31.
No. 121. Company C: Intermittent malaria, August 6; furloughed from division hospital September 17. In hospital this case was diagnosed typhoid fever.
No. 122. Company F: Malaria, August 6; furloughed from division hospital August 27. In hospital this case was diagnosed continued malaria.
No. 123. Company A: Continued malaria, August 6; furloughed from division hospital August 28.
No. 124. Company E: Diarrhea, August 6; still sick in division hospital August 31.
No. 125. Company C: Typhoid fever, August 6; still sick in division hospital August 31.
No. 126. Company L: Typhoid fever, August 6; disposition not given.
No. 127. Company C: Intermittent malaria, August 7 to 26.
No. 128. Company E: Typhoid fever, August 7; still sick in division hospital August 31.
No. 129. Company C: Typhoid fever, August 7; furloughed from division hospital August 28.
No. 130. Company A: Typhoid fever, August 7; furloughed from division hospital August 28.
No. 131. Company K: Typhoid fever, August 7; furloughed from division hospital August 17.
No. 132. Company M: Typhoid fever, August 8; still sick in division hospital August 31.
No. 133. Company A: Intermittent malaria, August 9 to 25.
No. 134. Company K: Typhoid fever, August 9; died September 2.
No. 135. Company I: Typhoid fever, August 10; furloughed from division hospital August 24.
No. 136. Company H: Continued malaria, August 10; furloughed from division hospital August 31.
No. 137. Company M: Typhoid fever, August 11; still sick in division hospital August 31.
No. 138. Company K: Hepatic torpor, August 12 to 30.
No. 139. Company L: Intermittent malaria, August 12; still sick in division hospital August 31. In hospital this case was diagnosed typhoid fever.
No. 140. Company L: Intermittent malaria, August 12; furloughed August 27.
No. 141. Company E: Typhoid fever, August 13; furloughed from Leiter Hospital October 23.
No. 142. Company F: Typhoid fever, August 13; still sick in division hospital August 31.
No. 143. Company M: Typhoid fever, August 13; furloughed from Sternberg Hospital October 4.
No. 144. Company K: Intermittent malaria, August 14; furloughed August 28.
No. 145. Company B: Remittent malaria, August 15; furloughed August 29.
No. 146. Company L: Remittent malaria, August 15 to September 4.
No. 147. Company I: Diarrhea, August 15; still sick in division hospital August 31.
No. 148. Company G: Intermittent malaria, August 15 to September 12.
No. 149. Company I: Typhoid fever, August 15; furloughed from Sternberg Hospital October 24.
No. 150. Company H: Remittent malaria, August 16 to 31.
No. 151. Company K: Typhoid fever, August 16; furloughed from Sternberg Hospital August 20.
No. 152. Company G: Typhoid fever, August 16; died in Sternberg Hospital August 25.
No. 153. Company G: Diarrhea, August 16 to September 6.

No. 154. Company A: Typhoid fever, August 16; furloughed from Sternberg Hospital September 2.

No. 155. Company G: Intermittent malaria, August 17 to September 1.

No. 156. Company H: Intermittent malaria, August 17 to September 6.

No. 157. Company C: Hepatic torpor, August 17; furloughed from division hospital September 15. In hospital this case was diagnosed typhoid fever.

No. 158. Company H: Undetermined fever August 18; still sick September 30.

No. 159. Company G: Remittent malaria, August 18; furloughed from Sternberg Hospital October 4.

No. 160. Company M: Dysentery, August 19; still sick in Sternberg Hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 161. Company H: Intermittent malaria, August 19 to September 6.

No. 162. Company G: Intermittent malaria, August 20; still sick in Sternberg Hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 163. Company D: Intermittent malaria, August 20; furloughed from division hospital October 4. In hospital this case was diagnosed typhoid fever.

No. 164. Company F: Intermittent malaria, August 20 to September 4.

No. 165. Company F: Intermittent malaria, August 22; furloughed September 30.

No. 166. Company F: Typhoid fever, August 22; furloughed from Sternberg Hospital October 6.

No. 167. Company G: Remittent malaria, August 25; furloughed from Sternberg Hospital September 25. In hospital this case was diagnosed typhoid fever.

No. 168. Company G: Intermittent malaria, August 25 to September 21.

No. 169. Company K: Typhoid fever, August 26; furloughed from Sternberg Hospital September 26.

No. 170. Company H: Intermittent malaria, August 26 to October 14.

No. 171. Company H: Intermittent malaria, August 26; furloughed September 6.

No. 172. Company L: Intermittent malaria, August 26; furloughed September 8.

No. 173. Company B: Undetermined fever, August 27; still sick in Sternberg Hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 174. Company C: Remittent malaria, August 27; still sick in division hospital September 30.

No. 175. Company H: Intermittent malaria, August 27; furloughed September 12.

No. 176. Company G: Remittent malaria, August 27; furloughed September 12.

No. 177. Company G: Without date or diagnosis; sent to Leiter Hospital August 27. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 24.

No. 178. Company I: Hepatic torpor, August 28; sent to Sternberg Hospital September 4. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 4.

No. 179. Company C: Intermittent malaria August 28; still sick in division hospital September 30.

No. 180. Company E: Intermittent malaria, August 29; furloughed September 13.

No. 181. Company D: Remittent malaria, August 29; furloughed from Sternberg Hospital October 4. In hospital this case was diagnosed typhoid fever.

No. 182. Company H: Malaria, August 29; furloughed from Sternberg Hospital September 7. In hospital this case was diagnosed typhoid fever.

No. 183. Company not given: Typhoid fever, August 30; sent to Sternberg Hospital August 31.

No. 184. Company D: Intermittent malaria, August 30; still sick in division hospital September 30.

No. 185. Company E: Remittent malaria, August 30; furloughed from Sternberg Hospital September 17. In hospital this case was diagnosed continued malaria.

No. 186. Company I: Intermittent malaria, August 31; still sick in hospital September 30.

No. 187. Company H: Remittent malaria, August 31; furloughed September 14.

No. 188. Company L: Without date or diagnosis; sent to Sternberg Hospital August 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 15.

No. 189. Company K: Without date or diagnosis; sent to Sternberg Hospital August 31. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 10.

No. 190. Company B: Remittent malaria, August 31; furloughed from Sternberg Hospital October 4.

No. 191. Company G: Diarrhea, August 31; furloughed from Sternberg Hospital October 7. In hospital this case was diagnosed remittent malaria.

No. 192. Company F: Without date or diagnosis; sent to Sternberg Hospital August 31. Here the disease was diagnosed remittent malaria, and the patient was furloughed September 23.

No. 193. Company M: Typhoid fever, August 31; furloughed September 7.

No. 194. Company F: Remittent malaria, September 1; furloughed from Sternberg Hospital October 14. In hospital this case was diagnosed typhoid fever.

No. 195. Company B: Remittent malaria, September 1; furloughed from Sternberg Hospital October 7. In hospital this case was diagnosed typhoid fever.

No. 196. Company D: Intermittent malaria, September 1; furloughed September 12.

No. 197. Company A: Malaria, September 3; still sick in Sternberg Hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 198. Company A: Intermittent malaria, September 3; furloughed from Sternberg Hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 199. Company F: Remittent malaria, September 3; still sick in Sternberg Hospital September 30.

No. 200. Company H: Diarrhea, September 3; furloughed September 14.

No. 201. Company M: Remittent malaria, September 3; furloughed from Sternberg Hospital September 17. In hospital this case was diagnosed typhoid fever.

No. 202. Company A: Remittent malaria, September 3; still sick in Sternberg Hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 203. Company L: Without date or diagnosis; sent to Sternberg Hospital September 3. Here the disease was diagnosed continued malaria, and the patient was furloughed October 4.

No. 204. Company K: Remittent malaria, September 3 to 27.

No. 205. Company H: Hepatic torpor, September 3; furloughed September 13.

No. 206. Company G: Diarrhea, September 3; furloughed September 13.

No. 207. Company K: Intermittent malaria, September 3 to 21.

No. 208. Company C: Without date or diagnosis; sent to Sternberg Hospital September 3. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 4.

No. 209. Company L: Typhoid fever, September 4; furloughed from Sternberg Hospital October 4.

No. 210. Company H: Diarrhea, September 4; furloughed from Sternberg Hospital October 20. In hospital this case was diagnosed typhoid fever.

No. 211. Company A: Hepatic torpor, September 5; furloughed from Sternberg Hospital October 21. In hospital this case was diagnosed typhoid fever.

No. 212. Company L: Intermittent malaria, September 5; still sick in division hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 213. Company F: Without date or diagnosis; sent to Sternberg Hospital September 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 8.

No. 214. Company C: Without date or diagnosis; sent to Sternberg Hospital September 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 4.

No. 215. Company G: Without date or diagnosis; sent to Sternberg Hospital September 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed October 5.

No. 216. Company L: Without date or diagnosis; sent to Sternberg Hospital September 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 26.

No. 217. Company K: Remittent malaria, September 5; furloughed from Sternberg Hospital September 9. In hospital this case was diagnosed typhoid fever.

No. 218. Company D: Without date or diagnosis; sent to Sternberg Hospital September 5. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 14.

No. 219. Company E: Typhoid fever, September 5; disposition not given.

No. 220. Company H: Constipation, September 6; furloughed from Sternberg Hospital September 17. In hospital this case was diagnosed typhoid fever.

No. 221. Company I: Intermittent malaria, September 6; still sick in Sternberg Hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 222. Company B: Diarrhea, September 7 to 22.

No. 223. Company K: Remittent malaria, September 7 to October 5.

No. 224. Company L: Typhoid fever, September 7; furloughed from Sternberg Hospital October 3.

No. 225. Company L: Typhoid fever, September 7; furloughed from Sternberg Hospital October 13.

No. 226. Company D: Intermittent malaria, September 7; still sick in division hospital September 30.

No. 227. Company I: Diarrhea, September 7 to October 14.

No. 228. Company M: Intermittent malaria, September 7 to 28.

No. 229. Company K: Remittent malaria, September 7 to 28.

No. 230. Company B: Without date or diagnosis; sent to Sternberg Hospital September 8. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 22.

No. 231. Company E: Without date or diagnosis; sent to Sternberg Hospital September 8. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 17.

No. 232. Company D: Remittent malaria, September 8 to October 5.

No. 233. Company G: Remittent malaria, September 8; furloughed from Sternberg Hospital September 17.

No. 234. Company D: Diarrhea, September 8 to 30.

No. 235. Company H: Diarrhea, September 8 to 27.

No. 236. Company L: Remittent malaria, September 8; still sick September 30.

No. 237. Company A: Without date or diagnosis; sent to Sternberg Hospital September 8. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 17.

No. 238. Company H: Without date or diagnosis; sent to Sternberg Hospital September 8. Here the disease was diagnosed typhoid fever, and the patient was furloughed September 10.

No. 239. Company B: Intermittent malaria, September 11 to 28.

No. 240. Company E: Remittent malaria, September 11 to 26.

No. 241. Company K: Remittent malaria, September 11 to 24.

No. 242. Company F: Remittent malaria, September 11 to October 16.

No. 243. Company F: Jaundice, September 11; still sick October 31.

No. 244. Company I: Intermittent malaria, September 12 to 30.

No. 245. Company K: Jaundice, September 12 to 27.

No. 246. Company I: Remittent malaria, September 12 to October 6.

No. 247. Company H: Remittent malaria, September 13 to October 2.

No. 248. Company I: Remittent malaria, September 14 to October 10.

No. 249. Company K: Remittent malaria, September 14 to October 5.

No. 250. Company G: Intermittent malaria, September 15 to October 7.

No. 251. Company M: Remittent malaria, September 15 to October 6.

No. 252. Company L: Remittent malaria, September 16 to October 6.

No. 253. Civilian: Remittent malaria, September 16 to October 13.

No. 254. Company D: Typhoid fever, September 17; furloughed September 30.

No. 255. Company K: Typhoid fever, September 18 to October 13.

No. 256. Company F: Remittent malaria, September 19 to October 6.

No. 257. Company not given: Remittent malaria, September 19 to October 8.

No. 258. Company A: Remittent malaria, September 20 to October 7.

No. 259. Company A: Remittent malaria, September 20 to October 17.

No. 260. Company L: Remittent malaria, September 20 to October 5.

No. 261. Company K: Diarrhea, September 20 to October 5.

No. 262. Company C: Remittent malaria, September 20; furloughed October 15.

No. 263. Company A: Remittent malaria, September 21; still sick October 31.

No. 264. Company K: Remittent malaria, September 22 to October 13.

No. 265. Company D: Remittent malaria, September 23 to October 12.

No. 266. Staff: Typhoid fever, September 23; died September 30.

No. 267. Company D: Remittent malaria, September 23 to October 20.

No. 268. Company I: Diarrhea, September 23 to October 27.

No. 269. Company I: Intermittent malaria, September 23 to October 10.

No. 270. Company M: Remittent malaria, September 24 to October 17.

No. 271. Company D: Remittent malaria, September 24; still sick in hospital October 31.

No. 272. Company K: Remittent malaria, September 25 to October 15.

No. 273. Company L: Remittent malaria, September 25 to October 14.

No. 274. Company L: Remittent malaria, September 25 to October 26.

No. 275. Company E: Remittent malaria, September 25 to October 26.

No. 276. Company M: Remittent malaria, September 25 to October 27.

No. 277. Company H: Malaria, September 26 to October 14.

No. 278. Company D: Remittent malaria, September 26 to October 16.

No. 279. Company I: Remittent malaria, September 26; furloughed October 4.

No. 280. Company B: Remittent malaria, September 26; still sick in hospital October 31.

No. 281. Company L: Remittent malaria, September 28 to October 22.

No. 282. Company I: Remittent malaria, September 29 to October 14.

No. 283. Company M: Diarrhea, September 29; still sick in hospital October 31.

No. 284. Company F: Remittent malaria, September 30; still sick in hospital October 31.

No. 285. Company M: Diarrhea, September 30 to October 14.

No. 286. Company F: Typhoid fever, October 4; still sick in hospital October 31.

No. 287. Company H: Remittent malaria, October 4 to 22.

SUMMARY.

Assembled at Camp Dodge, Little Rock, Ark., in April and May,
1898.

Mustered into United States service May 27, 1898.

Arrived at Chickamauga Park, Ga., May 30, 1898.

Strength on arrival, 1,029.

Date of first case of probable typhoid fever, June 4, 1898.

Date of first case of recognized typhoid fever, June 15, 1898.

Left Chickamauga Park, Ga., September 9, 1898.

Strength on departure, 1,291.

Number of cases of probable typhoid fever developed at Chick-amauga	238
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Arrived at Anniston, Ala., September 10, 1898.

Number of cases of probable typhoid fever developed after leaving Chickamauga.....	49
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Total number of cases of probable typhoid fever developed in the Second Arkansas Volunteer Infantry from May to October, 1898	287
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These 287 cases were diagnosed as follows:

Typhoid fever.....	95
Malaria.....	153
Diarrhea.....	28
Dysentery.....	3
Jaundice.....	2
Hepatic torpor.....	3
Hepatic engorgement.....	1
Undetermined fever.....	2

Total	287
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The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
		1898.		
Bizzell, Albert	Pvt., G	Aug. 19	Fort McPherson, Ga.	Typhoid.
Blankinship, Walter	Pvt., G	July 22	Chickamauga, Ga.	Do.
Carroll, J. L. D.	Pvt., D	Feb. 16	Camp Shipp, Ala.	Croupous pneumonia.
Davis, Isaac H.	Pvt., K	Aug. 29	Chickamauga, Ga.	Typhoid.
Engle, Wm. M.	Pvt. B	Aug. 16	Camp Thomas, Ga.	Do.
Erwin, Joseph J.	Pvt., I	Aug. 29	Chickamauga, Ga.	Pneumonia.
Evans, Commodore.	Pvt., G	Aug. 25	do	Typhoid.
Fowler, Wm. H.	Pvt., F.	Sept. 18	Sternberg Hospital, Ga.	Do.
Hays, David	Pvt., H.	Nov. 15	Home, Montgomery County, Tenn.	Pneumonia.
Johnson, James J.	Major.	Sept. 30	Anniston, Ala.	Typhoid.
Lee, Charles H.	Pvt., F.	Sept. 1	Camp Thomas, Ga.	Cerebral apoplexy.
Lewis, Artum G.	Pvt., M.	Sept. 1	do	Typhoid.
McKay, Samuel	Pvt., H.	Aug. 23	do	Pneumonia.
Martin, John W.	Pvt., H.	Dec. 7	Walnut Ridge, Ark.	Typhoid.
Obannon, Edward	Pvt., G.	Sept. 10	do	Do.
Otis, Joseph T.	1st Sgt., D.	July 31	Chickamauga, Ga.	Do.
Prather, Gordon G.	Pvt., A.	Sept. 23	Camp Shipp, Ala.	Cerebro-spinal meningitis.
Pratt, Milton D.	Pvt., C.	June 30	Camp Thomas, Ga.	Typhoid.
Ragland, Lewis L.	Pvt., G.	Aug. 14	do	Do.
Sanders, Claude C.	Pvt., H.	Sept. 6	Sternberg Hospital, Ga.	Do.
Sills, Harry L.	Pvt., L.	Sept. 15	Anniston, Ala.	Cerebro-spinal meningitis.
Skaggs, Jeff.	Pvt., H.	Sept. 7	Sternberg Hospital, Ga.	Measles.
Tisan, Wm. K.	Pvt., I.	Aug. 19	Chickamauga, Ga.	Typhoid.

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Tunstall, Charles P....	Corpl., M.	1898. Sept. 5	Near Salem, Ark.	(Typhoid) ; remittent fever.
Turner, Thomas L....	Artl., M.	1899 Jan. 3	Camp Shipp, Ala	Pneumonia.
Weaver, S. V	Pvt., E.	1898 July 3	Leiter Hospital, Ga....	Typhoid.

Total deaths.....	26
Deaths due to typhoid fever.....	17

Percentage of deaths among probable cases (287) of typhoid fever, 5.92

Percentage of deaths among recognized cases (95) of typhoid fever, 17.89.

COMMUNICATIONS FROM THE SURGEONS OF THE SECOND
ARKANSAS VOLUNTEER INFANTRY.

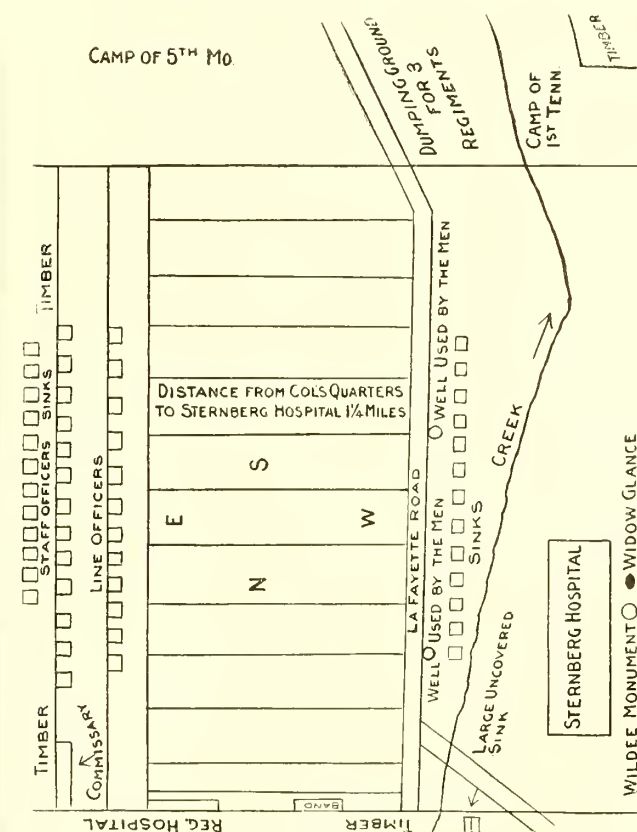
Medical Officers.

Horatio Wells, major and surgeon, Dermott, Ark.

Strodder U. King, lieutenant and assistant surgeon, Little Rock,
Ark.

Robert M. Enders, sr., lieutenant and assistant surgeon, Little Rock, Ark.

DIAGRAM OF THE SECOND CAMP OF THE SECOND ARKANSAS VOL-
UNTEER INFANTRY AT CHICKAMAUGA PARK.



Lieut. S. U. King states:

When I joined the regiment, August 2, 1898, it had moved the week before out of the woods into an open field, which sloped from the timber line on the east to and slightly beyond the Lafayette road on the west, beyond which the ground gradually rose until Sternberg Hospital was reached, a distance of three-quarters of a mile still farther west. Through the valley, between our camp and Sternberg Hospital, ran two streams, the water of either

of which could in summer be carried in a 6-inch pipe. The one nearest Sternberg Hospital was always dry except when it rained. At such times it drained "Bloody Pond." The other stream, which was nearer us, carried more water, and when we had heavy rains it became a torrent, flooding the bottom and washing out the contents of the sinks used by the men, which were dug between this stream and the Lafayette road, as is shown by the rough sketch I send you.

Before I joined the regiment it had been camped all the time in the dense woods, and through July it rained almost every day, so that it was impossible to keep the equipment, clothing, and bedding of the men dry. The result was that everything mildewed. The camp occupied by the regiment when I joined it was an ideal one. There was not a tree or shrub in it, and the country to the west for a mile and a quarter was open, also to the south for some distance. The ground of this camp inclined sharply to the west, and the drainage was perfect, so that within an hour after the hardest rains no mud or water could be found within the limits of our camp.

The water supply of this camp was bad. It was taken from two wells situated on the west side of the Lafayette road, which were very near the sinks used by the men. Another source of water supply was from a pipe into which was pumped water from Chickamauga Creek. This water was always muddy, and the men were afraid of it and finally abandoned it save for washing purposes and for use at the corral. Later an analysis ordered by the War Department reported this water to be pure and wholesome. The sinks at this camp were entirely inadequate for the purpose and were located too close to the quarters of the men. It was impossible to dig them more than 4 feet, and many of them were not more than 3 feet deep, though I am compelled to say that the digging was sometimes stopped before rock was reached. These sinks were often sadly neglected, in that they were not filled soon enough and new ones dug. They would fill with surface and seep water, so that a rain would cause them to flow out over the surface of the ground, thus creating centers of infection, odors, and disease. The flies were so numerous as to make it almost impossible to eat a meal unless protected by mosquito nets. Our regimental and division hospitals were infested by them in almost incredible numbers.

I am persuaded that if the men had been properly controlled, and had not been allowed to exercise their own will as to what they should eat and drink, and that if the medical department had carried out the instructions as issued by the Surgeon-General early in the summer, that 75 per cent of the sickness which occurred in the regiment while at Chickamauga could have been prevented. There was nothing in the local situation, until it became polluted by their own careless and filthy habits, to make men sick. All of our cases of diarrhea and cramps were easily traced to the common origin of stale pies and watermelons, secured by the men from wagons which were allowed to stop at the foot of our regiment.

We went into camp at Anniston, Ala., September 10, 1898, in thick woods and rain, locating our tents as best we could without any order, where we stayed two days, after which we were ordered to move to the top of a hill, which sloped to the north. This camp was soon cleared of the underbrush and smaller timber. We made this camp almost perfect during the following two months. Sickness declined, and the men gathered strength and color; diarrhea disappeared from the camp like magic. The records will show how well we got along, until far into December, when we had an epidemic of la grippe, which again filled our hospitals. Pneumonia and cerebro-spinal meningitis appeared at this time, though one fatal case of cerebro-spinal meningitis had developed on the day we went into camp at this place. No other cases appeared until late in November, or until a few weeks before the epidemic of la grippe. From these facts I was of the opinion that there was no relationship between the cerebro-spinal meningitis and la grippe, as was believed by some of the surgeons.

The sinks at this camp were perfect, as such things go. They

were dug 8 feet deep, 2 feet wide, and 20 feet long, covered by a house in which a long seat with, perhaps, a dozen holes, each with a cover on a hinge. Along the opposite side a urinal was made, and conducted the urine into the sinks. Lime was used freely. Ditches were cut and the dirt from them thrown up around the buildings high enough to keep out surface water. Colonel Cobbell was in command, and these sinks were not neglected. I neglected to say that the sinks at Camp Thomas were covered only with old worn-out tents and some of them not at all. Those which were left uncovered were located in the woods and had a pole set up on two forks which were used to sit upon.

The drainage at Camp Shipp was also perfect, so that we had no standing water or mud. The officers' streets and a few of the company streets were covered with a beautiful white sand, handled by the quartermaster's department. This sand was placed around the regimental hospital, in front of which I built a beautiful fountain in the shape of a Maltese cross. The water supply was the most perfect, I suppose, of any camp in the South. It was that used by the city of Anniston and came from an enormous spring 8 miles southwest of the city. It was conducted in pipes from the city to our camp and was supplied in unlimited quantities. It was perfectly clean, limpid, and sweet at all times. I believe the typhoid fever which occurred at this camp, and which first appeared in the Fourth Wisconsin Regiment, was brought to it from Cuba by the men of the Second Regular Infantry, who were camped alongside of them. Sporadic cases were, to my mind, accounted for by the use of water from an old spring situated in Anniston, under a high railroad embankment, very near a privy used by the employees of a manufactory of wooden ware. This spring was on a line of travel much used by the men in going from camp to the city and return. I was so confident of this source of infection that I reported it to General Frank, who had it nailed up.

SIXTY-NINTH NEW YORK VOLUNTEER INFANTRY.

Second Brigade, Second Division, Third Army Corps.

This regiment reached Chickamauga Park May 27, 1898, and left for Tampa, Fla., June 2. At Tampa it became a part of the Fourth Army Corps and continued with that corps throughout its service.

The first report is for the month of June.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,036
Diarrhea.....	112
Dysentery	1
Intermittent malaria.....	16
Remittent malaria.....	3
Other diseases.....	38
Total	170

Four cases of malaria and two of diarrhea were, according to the regimental records, sent to hospital. The two cases of diarrhea proved to be typhoid fever, as shown by the hospital records.

There is no report for July.

During the latter part of July this regiment was transferred to Fernandina, Fla.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,274
Diarrhea.....	2
Dysentery	5
Malaria.....	80
Typhoid fever.....	44

Accidental injury.....	28
Other diseases.....	51
Total	210

Late in August this regiment was transferred from Fernandina, Fla., to Huntsville, Ala. While making this transfer a railroad accident happened, in which 28 persons were injured.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,267
Dysentery	23
Diarrhea.....	5
Intermittent malaria.....	144
Remittent malaria.....	2
Accidental injury.....	15
Typhoid fever.....	63
Other diseases.....	67
Total	319

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,186
Dysentery	9
Malaria.....	77
Typhoid fever.....	36
Enteritis.....	5
Other diseases.....	96
Total	223

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

No. 1. Company G: Diarrhea, June 12 to 25.

No. 2. Company C: Sent to hospital June 23 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was transferred to some other hospital (name not given) June 30.

No. 3. Company E: Sent to hospital June 23 without diagnosis. Here the disease was diagnosed malaria, and the patient was transferred June 30.

No. 4. Company A: Sent to hospital June 23 without diagnosis. Here the disease was diagnosed typhoid fever, and the patient was transferred June 30.

No. 5. Company C: Sent to hospital June 27 without diagnosis. Here the disease was diagnosed dysentery, and the patient was transferred June 30.

It will save time and space to state here that, unless otherwise designated, all initial dates refer to time of admission to hospital. Really we have no regimental record of disease, and we have been compelled to rely wholly upon hospital reports.

No. 6. Company I: Typhoid fever, July 3; transferred July 14.

No. 7. Company E: Typhoid fever, July 9; sent to Fort McPherson July 14.

No. 8. Company F: Typhoid fever, July 9; transferred to Atlanta July 14.

No. 9. Company L: Typhoid fever, July 10; died July 14.

No. 10. Company A: Malaria, July 12 to August 12.

No. 11. Company E: Intermittent malaria, July 14; furloughed July 19.

No. 12. Company L: Malaria, July 16; furloughed July 24.

No. 13. Company not given: Typhoid fever, July 19; died on train from Tampa to Fort Thomas.

No. 14. Company K: Malaria, July 19; sent to Fort Thomas July 22; discharged September 16.

No. 15. Company H: Chronic diarrhea, July 19; still sick August 31.

No. 16. Company M: Typhoid fever, July 19; transferred to Fort Thomas July 22; furloughed November 3.

No. 17. Company F: Malaria, July 20; sent to Fort Thomas August 29. Here the disease was diagnosed typhoid fever, and the patient was discharged October 22.

No. 18. Company K: Remittent malaria, July 20; sent to Fort Thomas July 22; discharged October 8.

No. 19. Company K: Malaria, July 20; no record of return to duty.

No. 20. Company K: Diarrhea, July 20; still sick in hospital July 31.

No. 21. Company G: Dysentery July 21; sent to Fort Thomas July 27. Here the disease was diagnosed typhoid fever, and the man was still sick at last report.

No. 22. Company K: Malaria and dysentery, July 21; still sick in hospital August 31.

No. 23. Company H: Malaria, July 21; still sick in hospital August 31.

No. 24. Company F: Remittent malaria, July 22; furloughed September 24.

No. 25. Company B: Typhoid fever, July 23; transferred July 27.

No. 26. Company A: Malaria, July 23; furloughed August 4.

No. 27. Company K: Typhoid fever, July 23; sent to Fort Thomas July 29; discharged September 27.

No. 28. Company B: Typhoid fever, July 23; sent to Fort Thomas July 29; furloughed August 24.

No. 29. Company H: Intermittent malaria, July 24; furloughed July 25.

No. 30. Company D: Typhoid fever, July 24; sent to Fort Thomas July 29; furloughed August 16.

No. 31. Company B: Typhoid fever, July 24; sent to Fort Thomas July 29; furloughed September 20.

No. 32. Company K: Remittent malaria, July 24; sent to Fort Thomas July 29; discharged September 16.

No. 33. Company F: Typhoid fever, July 30; sent on hospital train August 7.

No. 34. Company K: Typhoid fever, July 30; died August 10.

No. 35. Company C: Typhoid fever, July 30; died August 2.

No. 36. Company C: Typhoid fever, July 30; sent to Fort Thomas and discharged October 25. The records of the hospital at Fort Thomas show that this patient was received at that hospital July 29.

No. 37. Company H: Typhoid fever, July 30; sent North on hospital train August 7.

No. 38. Company F: Typhoid fever, July 30; transferred August 29.

No. 39. Company F: Typhoid fever, July 30; sent on hospital train August 7.

No. 40. Company E: Typhoid fever, July 30; sent on hospital train August 1.

No. 41. Company M: Typhoid fever, August 1; sent on hospital train August 19.

No. 42. Company C: Typhoid fever, August 1; furloughed September 6.

No. 43. Company C: Typhoid fever, August 2; sent on hospital train September 6.

No. 44. Company G: Typhoid fever, August 3; transferred August 29.

No. 45. Company H: Typhoid fever, August 3; sent on hospital train August 23.

No. 46. Company H: Typhoid fever, August 3; sent to Fort Thomas August 20; discharged October 19.

No. 47. Company M: Typhoid fever, August 3; transferred August 5.

No. 48. Company G: Typhoid fever, August 4; sent on hospital train August 29.

No. 49. Company H: Typhoid fever, August 5; furloughed August 23.

No. 50. Company B: Typhoid fever, August 5; sent to Fort Thomas September 7; furloughed September 29.

No. 51. Company A: Typhoid fever, August 5; sent North on hospital train August 7.

No. 52. Company M: Typhoid fever, August 5; furloughed August 25.

No. 53. Company M: Typhoid fever, August 5; sent North on hospital train August 7.

No. 54. Company F: Typhoid fever, August 6; sent North on hospital train August 7.

No. 55. Company G: Typhoid fever, August 6; furloughed August 29.

No. 56. Company F: Typhoid fever, August 6; sent North on hospital train August 7.

No. 57. Company G: Typhoid fever, August 6; transferred on hospital train August 7.

No. 58. Company C: Typhoid fever, August 8 to September 7.

No. 59. Company F: Typhoid fever, August 8; furloughed from Fort McPherson September 17.

No. 60. Company H: Malaria, August 8; furloughed from hospital August 24.

No. 61. Company H: Intermittent malaria, August 8; furloughed from hospital September 7.

No. 62. Company C: Malaria, August 8; furloughed from hospital September 13.

No. 63. Company F: Malaria, August 8; furloughed from hospital August 24.

No. 64. Company M: Intermittent malaria, August 8; furloughed August 29.

No. 65. Company E: Typhoid fever, August 8; transferred August 29.

No. 66. Company B: Malaria, August 8; furloughed from hospital September 5.

No. 67. Company A: Malaria, August 8; furloughed from hospital September 5.

No. 68. Company M: Intermittent malaria, August 8; furloughed from hospital October 15.

No. 69. Company F: Typhoid fever, August 8; furloughed from Fort McPherson September 14.

No. 70. Company K: Typhoid fever, August 8; discharged from Fort Thomas September 26.

No. 71. Company D: Typhoid fever, August 8; furloughed from hospital September 27.

No. 72. Company K: Malaria, August 8; furloughed from hospital September 14.

No. 73. Company D: Malaria, August 8; furloughed from hospital August 28.

No. 74. Company D: Typhoid fever, August 10; discharged from Fort Thomas October 12.

No. 75. Company B: Typhoid malaria, August 10; furloughed August 18.

No. 76. Company K: Typhoid fever, August 11; furloughed from Fort Thomas September 30.

No. 77. Company C: Typhoid fever, August 13; transferred August 29.

No. 78. Company K: Typhoid fever, August 13; furloughed from Fort Thomas November 4. In this case typhoid fever was followed by cystitis.

No. 79. Company K: Typhoid fever, August 14; transferred August 17.

No. 80. Company K: Typhoid fever, August 14; transferred August 17.

No. 81. Company E: Typhoid fever, August 15; furloughed from hospital September 2.

No. 82. Company L: Typhoid fever, August 16; transferred August 17.

No. 83. Company G: Intermittent malaria, August 18; furloughed August 31.

No. 84. Company H: Diarrhea, August 18 to 30.

No. 85. Company H: Malaria, August 18; furloughed August 29.

No. 86. Company B: Typhoid fever, August 19; furloughed August 26.

No. 87. Company L: Typhoid fever, August 19; transferred August 29.

No. 88. Company D: Typhoid fever, August 21; transferred August 29.

No. 89. Company F: Malaria, August 24; furloughed from hospital September 6.

No. 90. Company H: Malaria, August 27; furloughed from hospital September 5.

No. 91. Company E: Typhoid fever, August 28; furloughed from hospital September 16.

No. 92. Company G: Malaria, August 28; furloughed from hospital September 1.

No. 93. Company E: Malaria, August 29; furloughed from hospital September 1.

No. 94. Company H: Malaria, August 29; furloughed from hospital September 3.

No. 95. Company I: Malaria, August 29; furloughed from hospital September 2.

No. 96. Company A: Malaria, August 29; furloughed from hospital September 5.

No. 97. Company I: Typhoid fever, August 29; furloughed from hospital September 1.

No. 98. Company C: Typhoid fever, August 29; disposition not given.

No. 99. Company G: Typhoid fever, August 29; furloughed from hospital September 6.

No. 100. Company B: Typhoid fever, August 29; furloughed; disposition not given.

No. 101. Company A: Malaria, August 29; furloughed from hospital September 1.

No. 102. Company M: Malaria, August 29; furloughed from hospital September 1.

No. 103. Company G: Typhoid fever, August 29; furloughed from hospital September 6.

No. 104. Company K: Typhoid fever, August 29; furloughed from hospital September 12.

No. 105. Company A: Typhoid fever, August 29; furloughed from hospital September 20.

No. 106. Company D: Typhoid fever, August 29; disposition not given.

No. 107. Company G: Typhoid fever, August 29; furloughed from hospital September 16.

No. 108. Company A: Typhoid fever, August 29; disposition not given.

No. 109. Company A: Malaria, August 29; furloughed from hospital September 5.

No. 110. Company F: Malaria, August 29; furloughed from hospital September 1.

No. 111. Company G: Typhoid fever, August 29; furloughed from hospital September 16.

No. 112. Company B: Typhoid fever, August 29; furloughed from hospital September 26.

No. 113. Company M: Typhoid fever, August 29; died in hospital September 12.

No. 114. Company H: Malaria, August 29; furloughed from hospital September 6.

No. 115. Company G: Malaria, August 29; furloughed from hospital September 3.

No. 116. Company G: Malaria, August 29; furloughed from hospital September 5.

No. 117. Company E: Malaria, August 29; furloughed from hospital September 3.

No. 118. Company B: Typhoid fever, August 30; disposition not given.

No. 119. Company D: Malaria, August 31; still sick September 30.

No. 120. Company B: Typhoid fever, September 1; disposition not given.

No. 121. Company E: Typhoid fever, September 1; disposition not given.

No. 122. Company A: Typhoid fever, September 1; disposition not given.

No. 123. Company I: Typhoid fever, September 1; disposition not given.

No. 124. Company B: Typhoid fever, September 1; disposition not given.

No. 125. Company M: Typhoid fever, September 1; furloughed from hospital September 3.

No. 126. Company G: Typhoid fever, September 1; furloughed from hospital September 7.

No. 127. Company F: Typhoid fever, September 2; disposition not given.

No. 128. Company B: Typhoid fever, September 2; furloughed from hospital September 16.

No. 129. Company G: Malaria, September 2; furloughed from hospital September 5.

No. 130. Company B: Malaria, September 2; furloughed from hospital September 6.

No. 131. Company B: Typhoid fever, September 2; disposition not given.

No. 132. Company F: Typhoid fever, September 2; furloughed from hospital September 3.

No. 133. Company B: Malaria, September 3; furloughed from hospital September 7.

No. 134. Company A: Malaria, September 3; furloughed from hospital September 10.

No. 135. Company G: Malaria, September 3; furloughed from hospital September 3.

No. 136. Company A: Malaria, September 3; furloughed from hospital September 7.

No. 137. Company A: Typhoid fever, September 3; died in hospital September 20.

No. 138. Company I: Typhoid fever, September 5; disposition not given.

No. 139. Company M: Malarial fever, September 7; discharged from Fort Thomas October 12.

No. 140. Company H: Typhoid fever, September 7; died in hospital September 25.

No. 141. Company A: Typhoid fever, September 7; disposition not given.

No. 142. Company A: Typhoid fever, September 8; disposition not given.

No. 143. Company M: Malaria, September 8; furloughed from hospital September 13.

No. 144. Company A: Typhoid fever, September 8; disposition not given.

No. 145. Company M: Malaria, September 8; furloughed from hospital September 13.

No. 146. Company I: Malaria, September 8; disposition not given.

No. 147. Company M: Typhoid fever, September 9; disposition not given.

No. 148. Company E: Malaria, September 9; furloughed from hospital September 12.

No. 149. Company B: Malarial fever, September 10; furloughed September 18.

No. 150. Company F: Malaria, September 10; still sick September 30.

No. 151. Company M: Typhoid fever, September 11; disposition not given.

No. 152. Company I: Dysentery, September 11 to 26.

No. 153. Company M: Typhoid fever, September 11; died in hospital September 18.

No. 154. Company B: Typhoid fever, September 12; disposition not given.

No. 155. Company G: Typhoid fever, September 12; disposition not given.

No. 156. Company D: Malaria, September 12; furloughed from hospital September 14.

No. 157. Company K: Typhoid fever, September 12; furloughed from hospital September 24.

No. 158. Company C: Malaria, September 12; furloughed from Fort Thomas without date.

No. 159. Company A: Typhoid fever, September 12; disposition not given.

No. 160. Company L: Typhoid fever, September 12; disposition not given.

No. 161. Company D: Malaria, September 12; furloughed from hospital September 14.

No. 162. Company G: Malaria, September 12; furloughed from hospital September 24.

No. 163. Company A: Malaria, September 12; furloughed from hospital September 14.

No. 164. Company G: Malaria, September 12; furloughed from hospital September 13.

No. 165. Company G: Malaria, September 13; furloughed from hospital September 14.

No. 166. Company C: Malaria, September 13; furloughed from hospital September 15.

No. 167. Company E: Malaria, September 13; furloughed from hospital September 15.

No. 168. Company G: Malaria, September 13; died in hospital September 17.

No. 169. Company B: Typhoid fever, September 13; disposition not given.

No. 170. Company E: Typhoid fever, September 13; died in hospital September 25.

No. 171. Company E: Typhoid fever, September 14; disposition not given.

No. 172. Company H: Typhoid fever, September 14; disposition not given.

No. 173. Company I: Typhoid fever, September 14; disposition not given.

No. 174. Company E: Intermittent malaria, September 14; furloughed September 25.

No. 175. Company A: Typhoid fever, September 15; disposition not given.

No. 176. Company C: Typhoid fever, September 15; disposition not given.

No. 177. Company I: Typhoid fever, September 15; disposition not given.

No. 178. Company G: Typhoid fever, September 15; disposition not given.

No. 179. Company I: Typhoid fever, September 15; disposition not given.

No. 180. Company F: Typhoid fever, September 16; disposition not given.

No. 181. Company E: Typhoid fever, September 16; disposition not given.

No. 182. Company G: Typhoid fever, September 16; disposition not given.

No. 183. Company G: Typhoid fever, September 16; disposition not given.

No. 184. Company L: Intermittent malaria, September 16 to October 2.

No. 185. Company E: Typhoid fever, September 17; disposition not given.

No. 186. Company B: Typhoid fever, September 17; disposition not given.

No. 187. Company B: Malaria, September 17; disposition not given.

No. 188. Company F: Typhoid fever, September 17; disposition not given.

No. 189. Company F: Typhoid fever, September 17; disposition not given.

No. 190. Company I: Malaria, September 17; furloughed from hospital September 26.

No. 191. Company D: Typhoid fever, September 17; disposition not given.

No. 192. Company K: Typhoid fever, September 17; furloughed from hospital September 23. This man reported from furlough still sick with typhoid fever, and was then sent to Fort Thomas.

No. 193. Company D: Typhoid fever, September 17; disposition not given.

No. 194. Company K: Typhoid fever, September 17; furloughed from hospital September 20.

No. 195. Company H: Typhoid fever, September 17; disposition not given.

No. 196. Company I: Malaria; September 17; furloughed from hospital September 26.

No. 197. Company D: Typhoid fever, September 17; furloughed September 27.

No. 198. Company A: Malaria, September 17; furloughed from hospital September 19.

No. 199. Company B: Intermittent malaria, September 17; furloughed September 29.

No. 200. Company I: Malaria, September 18; furloughed September 19.

No. 201. Company C: Malaria, September 18; furloughed September 19.

No. 202. Company D: Malaria, September 18; furloughed from hospital September 19.

No. 203. Company D: Malaria, September 18; furloughed from hospital September 19.

No. 204. Company C: Malaria, September 18; furloughed from hospital September 19.

No. 205. Company F: Malaria, September 18; furloughed from hospital September 20.

No. 206. Company H: Malaria, September 18; furloughed from hospital September 19.

No. 207. Company C: Malaria, September 18; furloughed from hospital September 19.

No. 208. Company A: Typhoid fever, September 18; disposition not given.

No. 209. Company L: Malaria, September 18; furloughed from hospital September 19.

No. 210. Company D: Malaria, September 18; furloughed from hospital September 19.

No. 211. Company G: Typhoid fever, September 18 to 30.

No. 212. Company G: Typhoid fever, September 19; disposition not given.

No. 213. Company K: Typhoid fever, September 19; disposition not given.

No. 214. Company C: Typhoid fever, September 19; disposition not given.

No. 215. Civilian: Typhoid fever, September 19; disposition not given.

No. 216. Company M: Typhoid fever, September 19; disposition not given.

No. 217. Company B: Typhoid fever, September 19; disposition not given.

No. 218. Company L: Typhoid fever, September 19; disposition not given.

No. 219. Company K: Malaria, September 19; furloughed from hospital September 20.

No. 220. Company C: Malaria, September 19; furloughed from hospital September 20.

No. 221. Company C: Malaria, September 19; furloughed from hospital September 20.

No. 222. Company H: Typhoid fever, September 20; disposition not given.

No. 223. Company H: Malaria, September 20; furloughed from Fort Thomas October 8. At Fort Thomas the case was diagnosed typhoid fever.

No. 224. Company K: Typhoid fever, September 21; disposition not given.

No. 225. Company A: Malaria, September 21; furloughed from hospital September 22.

No. 226. Company F: Typhoid fever, September 21; disposition not given.

No. 227. Company F: Typhoid fever, September 21; disposition not given.

No. 228. Company H: Typhoid fever, September 21; disposition not given.

No. 229. Company B: Typhoid fever, September 22; disposition not given.

No. 230. Company K: Typhoid fever, September 22; disposition not given.

No. 231. Company I: Typhoid fever, September 23; disposition not given.

No. 232. Company C: Typhoid fever, September 23; disposition not given.

No. 233. Company G: Typhoid fever, September 24; disposition not given.

No. 234. Company L: Continued fever, September 24; disposition not given.

No. 235. Company C: Malaria, September 24; furloughed from hospital September 27.

No. 236. Company M: Malaria, September 24; disposition not given.

No. 237. Company H: Typhoid fever, September 24; disposition not given.

No. 238. Company F: Continued fever, September 25; disposition not given.

No. 239. Company D: Malaria, September 25; furloughed from hospital September 27.

No. 240. Company F: Typhoid fever, September 25; disposition not given.

No. 241. Company H: Typhoid fever, September 26; disposition not given.

No. 242. Company F: Malaria, September 26; disposition not given.

No. 243. Company G: Typhoid fever, September 26; disposition not given.

No. 244. Company H: Malaria, September 26; disposition not given.

No. 245. Company F: Malaria, September 26, furloughed from hospital September 29.

No. 246. Company G: Malaria, September 26; furloughed from hospital September 27.

No. 247. Company G: Typhoid fever, September 27; disposition not given.

No. 248. Company E: Typhoid fever, September 27; disposition not given.

No. 249. Company A: Typhoid fever, September 27; disposition not given.

No. 250. Company E: Typhoid fever, September 27; disposition not given.

No. 251. Company L: Typhoid fever, September 27; disposition not given.

No. 252. Company I: Typhoid fever, September 28; furloughed from hospital November 13.

No. 253. Company F: Typhoid fever, September 28; disposition not given.

No. 254. Company E: Malaria, September 29; disposition not given.

No. 255. Company K: Malaria, September 29; disposition not given.

No. 256. Company G: Typhoid fever, September 30; disposition not given.

No. 257. Company H: Typhoid fever, September 30; disposition not given.

No. 258. Company E: Typhoid fever, September 30; disposition not given.

No. 259. Company F: Typhoid fever, September 30; disposition not given.

No. 260. Company D: Typhoid fever, October 1; disposition not given.

No. 261. Company E: Typhoid fever, October 1; disposition not given.

No. 262. Company E: Typhoid fever, October 1; disposition not given.

No. 263. Company D: Typhoid fever, October 2; disposition not given.

No. 264. Company C: Typhoid fever, October 3; disposition not given.

No. 265. Company G: Typhoid fever, October 3; disposition not given.

No. 266. Company G: Typhoid fever, October 3; disposition not given.

No. 267. Company M: Typhoid fever, October 5; disposition not given.

No. 268. Company F: Typhoid fever, October 5; disposition not given.

No. 269. Company D: Typhoid fever, October 5; disposition not given.

No. 270. Company H: Typhoid fever, October 7; disposition not given.

No. 271. Company M: Typhoid fever, October 7; disposition not given.

No. 272. Company B: Typhoid fever, October 8; disposition not given.

No. 273. Company G: Intermittent malaria, October 8 to November 1.

No. 274. Hospital steward: Typhoid fever, October 9; disposition not given.

No. 275. Company K: Typhoid fever, October 10; disposition not given.

No. 276. Company F: Typhoid fever, October 10; disposition not given.

No. 277. Company G: Typhoid fever, October 10; disposition not given.

No. 278. Company H: Typhoid fever, October 11; disposition not given.

No. 279. Company D: Typhoid fever, October 11; disposition not given.

No. 280. Company D: Typhoid fever, October 11; disposition not given.

No. 281. Hospital Corps: Typhoid fever, October 11; disposition not given.

No. 282. Company B: Typhoid fever, October 12; disposition not given.

No. 283. Company D: Typhoid fever, October 14; disposition not given.

No. 284. Company F: Typhoid fever, October 16; disposition not given.

No. 285. Company H: Typhoid fever, October 17; disposition not given.

No. 286. Company I: Typhoid fever, October 19; disposition not given.

No. 287. Company H: Typhoid fever, October 20; disposition not given.

No. 288. Company E: Typhoid fever, October 21; disposition not given.

No. 289. Company I: Typhoid fever, October 22; disposition not given.

No. 290. Company I: Typhoid fever, October 23; disposition not given.

No. 291. Company G: Malaria, October 24; furloughed from Fort Thomas without date.

No. 292. Company I: Intermittent malaria, October 24 to November 8.

No. 293. Company D: Typhoid fever, October 25; disposition not given.

No. 294. Company H: Intermittent malaria, October 26 to November 10.

No. 295. Company H: Typhoid fever, October 29; disposition not given.

No. 296. Company A: Typhoid fever, October 30; disposition not given.

No. 297. Company G: Typhoid fever, October 30; disposition not given.

No. 298. Company K: Intermittent malaria, November 3 to 17.

No. 299. Company D: Enteric fever, November 11 to 25.

SUMMARY.

Assembled at Camp Black, Long Island, N. Y., in April, 1898.
 Mustered into United States service May 6, 1898.
 Arrived at Chickamauga Park, Ga., May 27, 1898.
 Strength on arrival, 1,036.
 Left Chickamauga Park June 2, 1898.
 Strength on departure, 1,026.
 Arrived at Ybor City, near Tampa, Fla., June 6, 1898.
 Date of first case of probable typhoid fever, June 12, 1898.
 Date of first case of recognized typhoid fever, June 23, 1898.
 Left Tampa, Fla., July 24, 1898.

Number of cases of probable typhoid fever developed at Tampa. 32

Arrived at Fernandina, Fla., July 25, 1898.
 Left Fernandina, Fla., August 27, 1898.

Number of cases of probable typhoid fever developed at Fernandina, Fla. 58

Arrived at Huntsville, Ala., September 1, 1898.

Number of cases of probable typhoid fever developed at Huntsville, Ala. 209

Total number of cases of probable typhoid fever developed in the Sixty-ninth New York Volunteer Infantry from May to November, 1898. 299

These 299 cases were diagnosed as follows:

Typhoid fever.....	191
Malaria.....	99
Diarrhea.....	4
Dysentery.....	2
Continued fever.....	2
Enteric fever.....	1
Total.....	299

It is evident that the surgeon of this regiment considered enteric fever and typhoid fever as distinct diseases.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Burke, John	Pvt., B.	1898, Nov. 14	Huntsville, Ala.	Typhoid.
Casey, Thomas	Pvt., F.	Oct. 27	.....do	Do.
Crowley, Daniel	Pvt., F.	July 21	.....do	Do.
Donnelly, John	Pvt., K.	Nov. 16	Huntsville, Ala.	Do.
Donnelly, John F.	Pvt., D.	Oct. 8	.....do	Do.
Dougherty, T. J.	Pvt., D.	1899, Jan. 30	.....do	Pneumonia.
Duffy, Nicholas H.	Pvt., B.	1898, Aug. 29	Fernandina, Fla.	Typhoid.
Dwyer, Edward J.	Corpl., K.	Aug. 11	.....do	Do.
Ellfott, James W.	Corpl., I.	Nov. 3	Huntsville, Ala.	Do.
Flynn, Maurice J.	Pvt., C.	Aug. 2	Fernandina, Fla.	Do.
Gallagher, C. A.	Corpl., G.	Sept. 17	Huntsville, Ala.	Do.
Hennissy, Michael J.	Pvt., I.	July 14	Tampa, Fla.	Do.
Hopkins, James	Pvt., I.	Nov. 13	Huntsville, Ala.	Do.
Kennedy, John	Pvt., M.	Sept. 18	Camp Wheeler, Ala.	Do.
McAree, Arthur	Pvt., H.	July 29	Hospital train coming from Tampa, Fla.	(Typhoid); exhaustion due to malarial fever.
Mulleharn, Matthew ..	Pvt., I.	Nov. 21	Huntsville, Ala.	Typhoid.
Murray, Henry	Pvt., H.	1899, Jan. 12	.....do	Lobar pneumonia.
O'Brien, John J.	Corpl., K.	1898, Sept. 26	.....do	Typhoid and dysentery.
O'Farrell, Robert.	Mus., A.	Aug. 19	Fort McPherson, Ga. .	Pneumonia and typhoid.
Pyne, William	Pvt., B.	Oct. 27	Huntsville, Ala.	Typhoid.
Reilly, John	Pvt., M.	Sept. 12	Camp Wheeler, Ga.	Do.
Sweeney, Wm	Pvt., C.	Sept. 5	New York City	(Typhoid); malaria.
Tracy, James	Corpl., A.	Sept. 10	Huntsville, Ala.	Typhoid.
Wray, Wm. A.	Mus., K.	July 26	Newport, Ky	(Typhoid); chronic dysentery.
Young, Thomas	Pvt., C.	Sept. 25	Huntsville, Ala.	Typhoid.

Total deaths..... 25
Deaths due to typhoid fever..... 23

Percentage of deaths among probable cases (299) of typhoid fever, 7.69.

Percentage of deaths among recognized cases of typhoid fever (191), 12.04.

For the following information concerning this regiment, we are indebted to Capt. John Fuchsius, assistant surgeon of the regiment:

On reaching Chickamauga this regiment encamped in the pine woods, and began immediately to haul its drinking water from a spring about a mile distant. A guard was placed at this spring to prevent anyone from contaminating it. The only visible evidence of possible contamination from local surroundings was a house with a barn located about 150 feet from the spring. The water was hauled to the regiment in barrels and was not boiled. The ground was very hard, but sinks could be dug to a depth of about 6 feet. These sinks were located at a distance of about 150 feet from the nearest mess tents. These sinks were kept in good condition, and their contents were covered morning, noon, and night. The kitchen sinks were covered every time anything was thrown into them. The regiment remained at Chickamauga only six days and then went to Tampa. At Tampa the water supply was obtained from a well which was said to be 200 or 300 feet deep, but competent engineers from the regiment were sent to examine it, and reported it not more than 40 feet deep. The water from this well was not at all times clear, and sometimes it had a salty taste. This is what was known as the Guerra, Diaz & Co. well. During the first two or three weeks

after reaching Tampa no heavy rains fell, and fairly good sinks were dug. After the rainy season set in sinks could be dug only to a depth of 2½ feet, when they filled with water. Later it was found impossible to dig sinks at all without striking water. After this a certain area of ground was set apart for the deposition of fecal matter, and a dike was built around it. This dumping-ground was located about 150 feet from the regimental line. Typhoid fever began to appear during the third week after the regiment reached Tampa. Captain Fuchsius placed the number of typhoid fever cases developed at Tampa at 29, while we have placed it, as has been stated, at 32. Dr. Fuchsius believes that the men became infected at Tampa by drinking lemonade sold by a huckster and made by water obtained from a cigar factory. He stated that there were three water-closets within 3 or 4 feet of this well, and that the well was a very shallow one. He believed that the typhoid fever was continued at Fernandina in a similar manner. He stated that when the regiment first reached Fernandina the men obtained their drinking water from a negro cabin. This water was of pleasant taste and the men drank freely of it, but after two days it was discovered that a privy was located within 6 or 8 feet of the well. However, the prevalence of typhoid fever continued quite unabated after this regiment reached Huntsville, Ala. While it is possible that many of the cases that appeared after reaching Huntsville were due to previous infection, it is more than probable that the spread of the infection continued at that place, and in our opinion the Huntsville water supply was unquestionably safe. There can be no question that the typhoid infection became quite widely diffused through this regiment while at Tampa, and this infection was carried with the men to Fernandina and subsequently to Huntsville. In our opinion, the fact mentioned by Captain Fuchsius that the sick men disliked to go to the hospital, and remained in quarters often for two or three weeks with typhoid fever, was a more potent factor in the distribution of this disease than infected water.

COMMUNICATIONS FROM THE SURGEONS OF THE SIXTY-NINTH NEW YORK VOLUNTEER INFANTRY.

Medical officers.

Francis L. Oswald, major and surgeon, New York City.
John H. Fuchsins, captain and assistant surgeon, New York City.
Robert M. Daley, lieutenant and assistant surgeon, New York City.

Lieutenant Daley writes:

I did not join the regiment until August. The camp at that time was at Fernandina, Fla., and was admirably situated on a sandy knoll, which was well drained. The short, scrubby bushes covering the soil were cut off, making a pleasant site, although the sand was deep, making marches and drills fatiguing. Water was supplied each company through pipes leading from an artesian well. This water contained considerable sulphur, giving it a disagreeable odor and taste, but it contained very little organic matter. The latrines were not properly covered, and myriads of flies conveyed infection from these sources. The sudden change from the hot

breeze to the cool nights favored enteric troubles. It was nearly impossible to obtain milk for the sick. These are all the faults that I can find with this camp. Our location at Huntsville, Ala., was an excellent one, being on a plateau, well drained, and supplied with excellent water piped from the city. Here we remained too long on one spot, not changing from September 1, when we arrived, to January 27, 1899, when we left, save for changing the line of tents occasionally. Our tentage was poor and leaky for the first few months. Our regiment was infected with typhoid fever at Chickamauga and Tampa, most of the cases not developing until we were at Fernandina and Huntsville.

To a large extent the disease was due to the personal carelessness of the men, who did not take proper care of themselves, eating and drinking what they should have left alone.

FIRST MAINE VOLUNTEER INFANTRY.

Third Brigade, Second Division, Third Army Corps.

In the May report Major Bradbury, in charge, makes the following statement:

This regiment was mustered into service May 13, 1898. It remained at Camp Powers until May 27, on which date the regiment left for Camp George H. Thomas, arriving there May 30 at 6 p. m. The health of the command was excellent throughout.

CONDENSED SICK REPORT FOR MAY.

Mean strength	1,002
Bronchitis	5
Coryza	2
Pneumonia	1
Accidents	2
Constipation	1
Indigestion	1
Total	12

In the June report Captain O'Neill, in charge, states:

I have the honor to report that the health of the First Maine Regiment during the month of June was excellent. The diseases most prevalent have been caused by changes in climate, diet, and water, affecting the intestinal canal. Only two contagious cases were reported during the month, one of measles and one of mumps.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,047
Acute diarrhea	107
Enteritis	3
Dysentery	9
Undetermined fever	1
Other diseases	64
Total	184

It will be observed that the diagnosis of malaria does not occur in this regiment through May and June.

In the July report Captain O'Neill makes the following statement:

In general, I feel that the cause of our increased sick list has been due to the unfavorable weather which existed when we moved our camp and which has continued until the present time. We are endeavoring to overcome a great many of our diarrhea cases by having water boiled and by keeping the men off the ground at night by using board floors in their tents. There are many malarial cases and we are giving light doses of quinine to every man in the regiment twice a week.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,264
Intermittent malaria	24
Remittent malaria	31
Acute diarrhea	63
Typhoid fever	23
Dysentery	11
Undetermined fever	14
Other diseases	63
Total	229

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,222
Intermittent malaria	62
Remittent malaria	55
Acute diarrhea	110
Typhoid fever	38
Dysentery	12
Undetermined fever	22
Other diseases	46
Total	345

This regiment left Chickamauga Park, Ga., August 23, and returned to Camp Powers, Me.

In the September report Doctor O'Neill makes the following statement:

While at Camp Thomas the general health of the regiment grew steadily worse, the prevailing diseases being malaria, typhoid fever, dysentery, and acute diarrhea. Since coming to our present camp malarial fevers are much less, but typhoids continue to appear. The record of cases not completed in this report and sent to hospital at Camp Thomas is in accordance with order 148.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength not given.	
Intermittent malaria	41
Remittent malaria	26
Diarrhea	115
Dysentery	5
Typhoid fever	54
Enteritis	1
Other diseases	41
Total	283

There is no full report after that for September. However, in October Major O'Neill made the following statement:

The general condition of camp and men has improved since last month. Typhoid fever, malaria, and diarrhea have been the prevailing diseases.

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

- No. 1. Company F: Diarrhea, June 25 to July 22.
- No. 2. Company D: Typhoid fever, June 27; sent to Leiter Hospital July 5.
- No. 3. Company M: Diarrhea, June 28; still sick in division hospital July 31.
- No. 4. Band: Typhoid fever, June 29; furloughed from Leiter Hospital August 16.
- No. 5. Company D: Remittent malaria, July 1 to August 9.
- No. 6. Company K: Remittent malaria, July 2; furloughed from division hospital August 22.

- No. 7. Company G: Typhoid fever, July 2; died at Leiter Hospital July 20.
- No. 8. Company K: Undetermined fever, July 3 to August 6.
- No. 9. Company B: Remittent malaria, July 4 to 19.
- No. 10. Company C: Typhoid fever, July 5 to 29.
- No. 11. Company C: Typhoid fever, July 5; furloughed August 22.
- No. 12. Company F: Typhoid fever, July 5 to August 16.
- No. 13. Company H: Typhoid fever, July 5; furloughed from Leiter Hospital August 10.
- No. 14. Company M: Dysentery, July 6 to 27.
- No. 15. Company A: Typhoid fever, July 6; furloughed from division hospital August 16.
- No. 16. Company K: Remittent malaria, July 7; still sick in hospital July 31.
- No. 17. Company H: Typhoid fever, July 9; furloughed from Fort McPherson August 24.
- No. 18. Company M: Typhoid fever, July 9; disposition not given.
- No. 19. Company F: Remittent malaria, July 10; still sick in hospital July 31.
- No. 20. Company C: Typhoid fever, July 10 to August 9.
- No. 21. Company D: Undetermined fever, July 12; furloughed from division hospital August 15; returned to duty September 14.
- No. 22. Company L: Typhoid fever, July 14; furloughed from Fort McPherson August 18.
- No. 23. Company K: Dysentery, July 14 to 28.
- No. 24. Company L: Intermittent malaria, July 14; still sick in division hospital July 31.
- No. 25. Company M: Intermittent malaria, July 14 to August 10.
- No. 26. Company H: Undetermined fever, July 15 to August 8.
- No. 27. Company L: Remittent malaria, July 15; furloughed from division hospital August 27.
- No. 28. Company I: Intermittent malaria, July 15; furloughed from division hospital August 1.
- No. 29. Company K: Remittent malaria, July 16; furloughed from Fort McPherson August 18. At Fort McPherson this case was diagnosed typhoid fever.
- No. 30. Company B: Diarrhea, July 16 to 26.
- No. 31. Company M: Typhoid fever, July 18 to September 1.
- No. 32. Company G: Typhoid fever, July 18 to September 21.
- No. 33. Company B: Undetermined fever, July 18 to September 21.
- No. 34. Company not given: Intermittent malaria, July 18 to August 3.
- No. 35. Company L: Typhoid fever, July 19; disposition not given.
- No. 36. Company E: Typhoid fever, July 19; furloughed from division hospital August 4.
- No. 37. Company F: Typhoid fever, July 20; died July 30.
- No. 38. Band: Intermittent malaria, July 20 to September 1.
- No. 39. Band: Typhoid fever, July 20 to August 16.
- No. 40. Company F: Typhoid fever, July 20; died in Leiter Hospital August 5.
- No. 41. Company A: Typhoid fever, July 21; died in division hospital August 3.
- No. 42. Company D: Intermittent malaria, July 21 to August 2.
- No. 43. Company C: Remittent malaria, July 21 to August 1.
- No. 44. Company L: Typhoid fever, July 21; furloughed August 11.
- No. 45. Company B: Typhoid fever, July 22; furloughed August 15.
- No. 46. Company L: Diarrhea, July 23; furloughed August 9.
- No. 47. Company E: Typhoid fever, July 24; sent to division hospital July 24; further disposition not given.
- No. 48. Company I: Enteritis, July 24 to September 21.
- No. 49. Company L: Typhoid fever, July 25 to September 21.
- No. 50. Company K: Diarrhea, July 25; furloughed August 8.
- No. 51. Company I: Remittent malaria, July 25; furloughed August 6.
- No. 52. Company D: Typhoid fever, July 26 to September 21.
- No. 53. Company A: Diarrhea, July 26; furloughed August 13.
- No. 54. Company F: Typhoid fever, July 27; sent to division hospital July 27; further disposition not known.
- No. 55. Company I: Undetermined fever, July 27; sent to division hospital July 27; further disposition not known.
- No. 56. Company A: Intermittent malaria, July 27 to August 24.
- No. 57. Company D: Intermittent malaria, July 27 to September 21.
- No. 58. Company D: Intermittent malaria, July 28 to September 21.
- No. 59. Company K: Typhoid fever, July 29 to September 21.
- No. 60. Company D: Remittent malaria, July 29; still sick September 30.
- No. 61. Company E: Intermittent malaria, July 29; still sick August 31.
- No. 62. Company B: Diarrhea, July 29; furloughed August 15.
- No. 63. Company G: Typhoid fever, July 29; died August 13.
- No. 64. Company G: Typhoid fever, July 29; disposition not given.
- No. 65. Company E: Diarrhea, July 31; furloughed August 9.
- No. 66. Company E: Typhoid fever, July 31; furloughed August 7.
- No. 67. Company D: Typhoid fever, July 31; furloughed August 15.
- No. 68. Company D: Typhoid fever, July 31; furloughed August 15.
- No. 69. Band: Diarrhea, July 31; furloughed August 21.
- No. 70. Company G: Dysentery, August 1; furloughed August 15.
- No. 71. Company G: Malaria, August 1; furloughed August 16.
- No. 72. Company B: Dysentery, August 1 to September 21.
- No. 73. Company K: Typhoid fever, August 2; furloughed August 15.
- No. 74. Company not given: Remittent malaria, August 2; furloughed August 15.
- No. 75. Company B: Typhoid fever, August 3 to September 21.
- No. 76. Company M: Typhoid fever, August 3; furloughed August 15.
- No. 77. Company A: Typhoid fever, August 3; died August 11.
- No. 78. Company D: Typhoid fever, August 3; still sick in hospital August 31.
- No. 79. Company M: Typhoid fever, August 3; furloughed August 16; returned to duty September 27.
- No. 80. Company K: Typhoid fever, August 5; furloughed August 22; returned to duty September 21.
- No. 81. Company K: Remittent malaria, August 5; furloughed August 20.
- No. 82. Company H: Intermittent malaria, August 5; furloughed August 28.
- No. 83. Company H: Diarrhea, August 5; furloughed August 15; returned to duty September 21.
- No. 84. Company F: Typhoid fever, August 5; furloughed August 15; returned to duty September 21.
- No. 85. Company B: Typhoid fever, August 5; furloughed August 22; returned to duty September 21.
- No. 86. Company H: Malaria, August 5; furloughed August 21.
- No. 87. Company H: Typhoid fever, August 6; died August 29.
- No. 88. Company H: Typhoid fever, August 6; died at Sternberg Hospital August 20.
- No. 89. Company M: Remittent malaria, August 6; furloughed August 15.
- No. 90. Company D: Intermittent malaria, August 6; furloughed August 15; died. Date of death not given. This man was furloughed, as stated above, August 15, but was found too sick to travel, and was returned to hospital on the same date.

No. 91. Company H: Typhoid fever, August 6; furloughed August 22; returned to duty September 21.

No. 92. Company M: Diarrhea, August 7; furloughed August 15.

No. 93. Company M: Diarrhea, August 7; furloughed August 15; returned to duty September 21.

No. 94. Company G: Intermittent malaria, August 7; furloughed August 15; returned to duty September 21.

No. 95. Company M: Typhoid fever, August 7; sent to Sternberg Hospital August 15.

No. 96. Company M: Diarrhea, August 7 to September 21.

No. 97. Company K: Diarrhea, August 8; furloughed August 25; returned to duty September 21.

No. 98. Company A: Typhoid fever, August 9; died August 29.

No. 99. Company I: Remittent malaria, August 9; furloughed August 15; returned to duty September 21.

No. 100. Company C: Typhoid fever, August 10; furloughed August 15; returned to duty September 21.

No. 101. Company D: Diarrhea, August 10; furloughed August 15.

No. 102. Company G: Intermittent malaria, August 10; furloughed August 21.

No. 103. Company B: Diarrhea, August 10; furloughed August 21.

No. 104. Company L: Diarrhea, August 10; furloughed August 22; returned to duty September 21.

No. 105. Company M: Typhoid fever, August 11; furloughed August 15; returned to duty September 21.

No. 106. Company M: Intermittent malaria, August 11 to September 21.

No. 107. Company K: Intermittent malaria, August 12; furloughed August 15; returned to duty September 21.

No. 108. Company M: Remittent malaria, August 12; furloughed August 15; returned to duty September 21.

No. 109. Company L: Typhoid fever, August 12; furloughed August 15.

No. 110. Company K: Typhoid fever, August 12; died September 5. This man reported for duty August 16, but was returned to hospital.

No. 111. Company F: Diarrhea, August 12; furloughed August 15; returned to duty September 21.

No. 112. Company L: Dysentery, August 12 to September 1.

No. 113. Company E: Remittent malaria, August 12 to September 27.

No. 114. Company B: Remittent malaria, August 13; furloughed August 22; returned to duty September 21.

No. 115. Company K: Remittent malaria, August 13; furloughed August 22; returned to duty September 21.

No. 116. Company A: Dysentery, August 13; furloughed August 15; returned to duty September 21.

No. 117. Company L: Remittent malaria, August 13; furloughed August 15; returned to duty September 21.

No. 118. Company A: Diarrhea, August 13; furloughed August 15.

No. 119. Company B: Intermittent malaria, August 13; furloughed August 15; returned to duty September 21.

No. 120. Company B: Intermittent malaria, August 13; furloughed August 24; returned to duty September 21.

No. 121. Company B: Intermittent malaria, August 13; furloughed August 15.

No. 122. Company B: Diarrhea, August 13; died September 1.

No. 123. Company B: Intermittent malaria, August 13 to September 21.

No. 124. Company not given: Typhoid fever, August 14; furloughed August 17.

No. 125. Company H: Typhoid fever, August 14; furloughed August 22; returned to duty September 21.

No. 126. Company H: Undetermined fever, August 14; sent to division hospital August 14; further information is not given.

No. 127. Company L: Intermittent malaria, August 14; furloughed August 22; returned to duty September 21.

No. 128. Company F: Undetermined fever, August 15; sent to division hospital August 15; further disposition not given.

No. 129. Company K: Undetermined fever, August 15; furloughed August 24.

No. 130. Company F: Typhoid fever, August 15; died August 17.

No. 131. Company M: Typhoid fever, August 15; died in Leiter Hospital August 18.

No. 132. Company H: Intermittent malaria, August 15; furloughed August 22; returned to duty September 21.

No. 133. Company M: Diarrhea, August 15 to September 5.

No. 134. Company C: Intermittent malaria, August 15 to September 1.

No. 135. Company L: Typhoid fever, August 16; furloughed August 22; returned to duty September 21.

No. 136. Company L: Undetermined fever, August 16; furloughed August 24.

No. 137. Company L: Undetermined fever, August 16; furloughed August 23.

No. 138. Company H: Intermittent malaria, August 16; furloughed August 22; returned to duty September 21.

No. 139. Company L: Typhoid fever, August 16; furloughed August 22; returned to duty September 21.

No. 140. Company H: Typhoid fever, August 16; died in Leiter Hospital August 21.

No. 141. Company G: Intermittent malaria, August 16; furloughed August 24; returned to duty September 21.

No. 142. Company E: Typhoid fever, August 16; furloughed August 27; returned to duty September 21.

No. 143. Company I: Typhoid fever, August 17; died August 24.

No. 144. Company B: Typhoid fever, August 17; sent to division hospital August 21; disposition not given.

No. 145. Company B: Diarrhea, August 19; sent to division hospital August 19; further disposition not given.

No. 146. Company B: Diarrhea, August 19; furloughed from division hospital August 23.

No. 147. Company H: Intermittent malaria, August 19; sent to division hospital August 19; further disposition not given.

No. 148. Company B: Undetermined fever, August 19; furloughed August 24.

No. 149. Company L: Undetermined fever, August 20; still sick in division hospital August 31.

No. 150. Company H: Undetermined fever, August 20; still sick in hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 151. Company B: Diarrhea, August 29; furloughed August 29; died from typhoid fever at home September 6.

No. 152. Company B: Intermittent malaria, August 29 to September 21.

No. 153. Company H: Typhoid fever, August 29; furloughed September 25.

No. 154. Company I: Typhoid fever, August 29; furloughed September 13.

No. 155. Company E: Typhoid fever, August 29; furloughed September 25.

No. 156. Company E: Typhoid fever, August 29; furloughed September 25.

No. 157. Company F: Typhoid fever, August 29; died September 22.

No. 158. Company M: Typhoid fever, August 29; still sick at home September 30.

No. 159. Company D: Diarrhea, August 29 to September 25.

No. 160. Company C: Remittent malaria, August 29; furloughed September 6.

No. 161. Company K: Diarrhea, August 29; furloughed September 20.

No. 162. Company H: Typhoid fever, August 30; died September 7.

No. 163. Company M: Typhoid fever, August 30; died September 16.

No. 164. Company A: Typhoid fever, August 30; died September 21.

No. 165. Company D: Intermittent malaria, August 30 to September 21.

No. 166. Company A: Typhoid fever, August 31; still sick September 30.

No. 167. Company K: Typhoid fever, September 1; died September 26.

No. 168. Company C: Typhoid fever, September 1 to 21.

No. 169. Company I: Typhoid fever, September 1; died September 11.

No. 170. Band: Typhoid fever, September 1; furloughed September 8.

No. 171. Company H: Typhoid fever, September 1 to 25.

No. 172. Band: Typhoid fever, September 1; still sick September 30.

No. 173. Company D: Diarrhea, September 1 to 22.

No. 174. Company M: Diarrhea, September 1 to 27.

No. 175. Company D: Diarrhea, September 1 to 22.

No. 176. Company G: Diarrhea, September 1 to 21.

No. 177. Company L: Diarrhea, September 1 to 21.

No. 178. Company B: Typhoid fever, September 2; died September 9.

No. 179. Company B: Typhoid fever, September 2 to 25.

No. 180. Company B: Typhoid fever, September 2 to 21.

No. 181. Company B: Typhoid fever, September 2; died September 6.

No. 182. Company K: Typhoid fever, September 3 to 28.

No. 183. Company A: Typhoid fever, September 3 to 25.

No. 184. Company A: Typhoid fever, September 3 to 25.

No. 185. Company C: Diarrhea, September 5 to 21.

No. 186. Company F: Typhoid fever, September 7; still sick September 30.

No. 187. Company I: Typhoid fever, September 7; still sick September 30.

No. 188. Company E: Diarrhea, September 7 to 21.

SUMMARY.

Assembled at Camp Powers, Me., during April and May, 1898.

Mustered into United States service May 13, 1898.

Arrived at Chickamauga Park, Ga., May 30, 1898.

Strength on arrival, 1,002.

Date of first case of probable typhoid fever, June 25, 1898.

Date of first case of recognized typhoid fever, June 27, 1898.

Left Chickamauga Park, Ga., August 23, 1898.

Strength on departure, 1,286.

Number of probable cases of typhoid fever developed at Chickamauga..... 150

Went from Chickamauga Park, Ga., to Camp Powers, Me.

Number of probable cases of typhoid fever developed after leaving Chickamauga..... 38

Total number of cases of probable typhoid fever developed in the First Maine Volunteer Infantry from May to September, 1898..... 188

These 188 cases were diagnosed as follows:

Typhoid fever.....	88
Undetermined fever.....	12
Malaria.....	49
Diarrhea.....	32
Dysentery.....	6
Enteritis.....	1

Total..... 188

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Annis, William L.....	Pvt., L.	1898. Sept. 14	M. G. Hospital, Portland, Me.	Typhoid.
Bartlett, F. T.....	Capt., D.	July 3	Camp Thomas, Ga.....	(Typhoid); acute dysentery.
Braum, Jesse C.....	Pvt., F.	July 30	.....do.....	Typhoid.
Broughton, G. S.....	Pvt., A.	Aug. 3	.....do.....	Do.
Brophy, James.....	Pvt., B.	Sept. 6	.....do.....	Do.
Bucklin, H. E.....	Pvt., H.	Sept. 13	Warren, Me.....	Do.
Calderwood, W. L.....	Pvt., F.	Sept. 15	Portland, Me.....	Typhomalaria.
Carpenter, W. A.....	Pvt., H.	Sept. 2	.....do.....	Typhoid.
Clark, Luther A.....	Corpl., K.	Aug. 13	.....do.....	Do.
Clinton, F. J.....	Pvt., K.	Sept. 1	M. G. Hospital, Portland, Me.	Do.
Cummings, Guy.....	Pvt., F.	Aug. 31	Belgrade, Me.....	Do.
Desjardins, W. R.....	Pvt., C.	Sept. 18	Lewiston, Me.....	Do.
Dyer, Arthur W.....	Pvt., B.	Sept. 6	Augusta, Me.....	Do.
Freeman, C. P.....	Pvt., M.	Sept. 3	Maine Eye and Ear Infirmary, Portland, Me.	Do.
Gibbs, Roscoe L.....	Pvt., I.	Sept. 11	City Hospital, Augusta, Me.	Do.
Grover, I. W.....	Pvt., B.	Sept. 10	Augusta, Me.....	Do.
Hackett, E. A.....	Pvt., H.	Aug. 20	Field Hospital, Chickamauga, Ga.	Do.
Haggerty, James F....	Pvt., I.	Aug. 24	Enroute, near Sumter, S. C.	Do.
Heal, Ivra.....	Pvt., H.	Aug. 28	Portland, Me.....	Do.
Heaphy, A. F.....	Pvt., L.	Aug. 23	.....do.....	Do.
Heaphy, James M.....	Pvt., L.	Sept. 12	Eye and Ear Infirmary, Portland, Me.	Do.
Higgins, P. E.....	Sgt., A.	Aug. 24	Portland, Me.....	Do.
Kateon, Ernest E.....	Pvt., E.	Sept. 9	Eye and Ear Infirmary, Portland, Me.	Do.
Lamson, Harold.....	Pvt., D.	Oct. 2	Augusta, Me.....	Do.
Leslie, James L.....	Corpl., K.	Aug. 4	Camp Thomas, Ga.....	Typhoid paralysis.
Libby, Carl W.....	Corpl., A.	Aug. 10	Chattanooga, Tenn.....	Typhoid.
McDougall, C. F.....	Pvt., F.	Aug. 18	Second Division hospital, Third Army Corps, Chickamauga, Ga.	(Typhoid); acute dysentery.
McGilvary, Alex.....	Pvt., H.	Aug. 21	Leiter Hospital, Ga.....	Typhoid.
Marrow, Chas. S.....	Pvt., M.	Aug. 18	Camp Thomas, Ga.....	Do.
Morse, Arthur B.....	Pvt., B.	Aug. 21	Jersey City, N. J.....	Do.
Murren, Henry J.....	Pvt., E.	Nov. 1	Portland, Me.....	Do.
Nelson, Benj.....	Corpl., A.	Aug. 28	.....do.....	Do.
Normandin, Eugene.....	Pvt., G.	Aug. 13	Camp Thomas, Ga.....	Do.
Painchaud, E.....	Band.	Sept. 23	Biddeford, Me.....	Do.
Perkins, C. E.....	Pvt., G.	July 20	Chickamauga, Ga.....	Do.
Poore, W. W.....	Corpl., F.	Aug. 5	.....do.....	Do.
Scott, Chas. C.....	Sgt., D.	Aug. 31	Portland, Me.....	Do.
Scribner, R. A.....	Pvt., B.	Aug. 28	M. G. Hospital, Portland, Me.	Do.
Slater, George.....	Pvt., M.	Sept. 10	City Hospital, Augusta, Me.	Do.
Smith, Ardacton.....	Pvt., C.	Nov. 16	Augusta, Me.....	Do.
Thibbetts, Geo. W.....	Pvt., C.	Aug. 22	Auburn, Me.....	Do.
Tripp, E. C.....	Pvt., F.	Sept. 22	Augusta, Me.....	Typhoid malaria.
Ulmar, Ralph A.....	Major.	Sept. 4	Rockland, Me.....	Do.
Wyman, William W.....	Pvt., K.	Sept. 22	Augusta, Me.....	Typhoid.
Young, Geo. W.....	Pvt., H.	Sept. 5	Rockland, Me.....	Do.

Total deaths.....	45
Deaths due to typhoid fever.....	45

Percentage of deaths among probable cases of typhoid fever (188), 23.93.

Percentage of deaths among recognized cases of typhoid fever (88), 51.13.

FIFTY-SECOND IOWA VOLUNTEER INFANTRY.

Third Brigade, Second Division, Third Army Corps.

This regiment was mustered into service at Camp McKinley, Des Moines, Iowa, May 25, 1898. It left Camp McKinley May 28, and arrived at Chickamauga Park, Ga., May 31. The first report covers the period from May 25 to May 31, inclusive. Apparently the regiment did not contain more than half its full strength at this time, as the mean strength is given at 572.

Only four cases are included in this report, and none of these could have any possible connection with typhoid fever. The regiment was in charge of Maj. A. C. Bergen.

Acting Surgeon Knott signs the June report and makes the following statement:

The prevalent disorder during the month has been acute diarrhea, occasioned not so much by the change of climate, water, etc., as by the general disposition on the part of the men to buy from hucksters, and eat all kinds of truck, such as overripe fruit, fried chicken, milk which was frequently beginning to ferment. Another cause was carelessness in regard to clothing, sitting or standing around in the air during the evening when it turns much cooler than during the day, with no blouse on and often only an undershirt and drawers. An earnest attempt has been made to eliminate these causes, by ordering the men to discontinue the above-named habits, and also by ordering the wagons from the grounds. Muscular rheumatism has been quite prevalent, due in all probability to the marked change in temperature between day and night and the dampness which prevails after sundown. The entire command has been vaccinated, no serious sore arms resulting in any case. The systemic disturbance in probably 75 was sufficient to demand that the command be excused from duty for two or three days.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,031
Acute diarrhea	153
Intermittent malaria	6
Dysentery	3
Typhoid fever	2
Other diseases	89
Total	253

The recognized cases of typhoid fever were privates in Companies A and B.

In the July report Surgeon Knott makes the following statement:

Typhoid fever has been quite prevalent for the past month in this regiment, there having been about fourteen cases due to drinking contaminated spring water from surface springs, contrary to the order requiring that all water for drinking or bathing should be boiled. Strenuous efforts have been made to compel the boiling of all water used. The patients have been sent to division hospital at once, and stools have been disinfected. Malaria has been more in evidence than hitherto, owing to almost daily rains. It has been of a mild type. Diarrhea continues, but not so frequently as at last report, nor does it seem so stubborn in yielding to treatment.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,327
Intermittent malaria	13
Remittent malaria	1
Acute diarrhea	291
Enteritis	11
Dysentery	3
Typhoid fever	20
Other diseases	70
Total	409

In the August report Major Bergen makes the following statement:

The health of the regiment was good until the 13th instant, when there were 41 new cases, with 20 to 40 additional daily, about one-half being diagnosed as intermittent malarial fever, many of which subsequently developed into severe cases of typhoid fever. These cases of so-called malarial fever were not typical cases of fever of any kind—were characterized by high evening tempera-

ture from the beginning. The cause is obscure. Certainly it can not be attributed to any one condition. Those who persistently drank nothing but boiled water, or coffee, or tea, did not escape. There were no swamps or mosquitoes in the vicinity, but millions of flies. The camp was kept as clean as policing would do it. The sinks, while not ideal, were kept in very fair condition. The rations were good and abundant, the bread being good and baked fresh every day. Fresh meat, issued seven days out of ten, was of the finest quality, transported in refrigerator cars and in good condition when issued. In my opinion, the long continued camping in close quarters on one spot, the extreme monotony of life, the hot days followed by damp and often cool nights, disappointment caused by the ending of hostilities before the opportunity of seeing active service, were some of the factors leading to the sickly results. Pursuant to Special Order 80, Headquarters George H. Thomas Camp, dated August 19, 1898, the regiment left Chickamauga Park en route to Camp McKinley, Des Moines, Iowa, August 28, reaching destination August 30. Prior to this many men had gone to their homes on sick furloughs and about 180 were sent home on special hospital trains. Of the sick who accompanied the regiment, 34 were sent to Cottage Hospital, in the city of Des Moines, and 54 have been received in the hospital at Camp McKinley.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,295
Intermittent malaria	377
Remittent malaria	22
Acute diarrhea	188
Enteritis	5
Dysentery	7
Typhoid fever	52
Other diseases	71
Total	722

In the September report Major Bergen states:

The Fifty-second Regiment was in Camp McKinley for only about ten days during this month, the men being sent to their homes pursuant to the provisions of General Orders, No. 130, War Department, Adjutant-General's Office, current series. Those sick but able to travel were given sick furloughs. Those too sick to travel were cared for in Camp McKinley Hospital, which was established in the commodious and well-appointed building known as the Hyde Park Sanitarium, located at a distance of about one-half mile from Camp McKinley. Of the 300 cases covered by this report 119 have been diagnosed as typhoid fever. In some of these cases the disease, and in others the germs, were brought from Chickamauga Park, Ga. Many of the cases originally diagnosed as malarial fever or acute diarrhea subsequently developed into cases of typhoid fever. No company or regimental records have been kept since the 8th of the month. Many cases of sickness have developed among the men at their homes, and some have died, of which, in the absence of records, it is impossible to obtain correct data. Most of the cases of typhoid fever treated in the hospital have been of severe type, with a highly nervous condition prevailing. The mortality has been about 6 per cent.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,282
Intermittent malaria	122
Remittent malaria	4
Acute diarrhea	30
Dysentery	1
Enteritis	1
Typhoid fever	119
Other diseases	23
Total	300

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

- No. 1. Company A: Typhoid fever, June 8; furloughed July 11.
- No. 2. Company F: Typhoid fever, June 26; furloughed August 2.
- No. 3. Company G: Diarrhea, July 1; still sick July 31.
- No. 4. No company: Enteritis, July 1 to August 29.
- No. 5. Company L: Enteritis, July 1 to 24.
- No. 6. Company D: Typhoid fever, July 4; died July 9.
- No. 7. Company D: Enteritis, July 7 to 20.
- No. 8. Company M: Typhoid fever, July 9 to August 17.
- No. 9. Company A: Typhoid fever, July 9; sent to Fort McPherson July 25.
- No. 10. Company G: Enteritis, July 10; died August 4.
- No. 11. Company E: Diarrhea, July 11; still sick July 31.
- No. 12. Company E: Diarrhea, July 11; furloughed August 1.
- No. 13. Company F: Typhoid fever, July 14 to August 7. This case was first diagnosed diarrhea.
- No. 14. Company I: Enteritis, July 14 to 30.
- No. 15. Company B: Diarrhea, July 15 to August 17. In the hospital this case was diagnosed as undetermined fever.
- No. 16. Company K: Typhoid fever, July 15; furloughed from Leiter Hospital August 21.
- No. 17. Company F: Typhoid fever, July 15; sent to Fort McPherson July 25; died July 29.
- No. 18. Company B: Typhoid fever, July 15; sent to Fort McPherson July 25.
- No. 19. Company M: Typhoid fever, July 17; sent to Fort McPherson July 25.
- No. 20. Company M: Typhoid fever, July 17; sent to Fort McPherson July 25.
- No. 21. Company M: Typhoid fever, July 17; sent to Fort McPherson July 25.
- No. 22. Company F: Typhoid fever, July 18; furloughed July 21.
- No. 23. Company B: Diarrhea, July 18 to September 13.
- No. 24. Company G: Typhoid fever, July 18; furloughed from Leiter Hospital August 24.
- No. 25. Company K: Typhoid fever, July 19; furloughed from Leiter Hospital September 10.
- No. 26. Company A: Diarrhea, July 19 to August 18. In the division hospital this case was diagnosed typhoid fever.
- No. 27. Company L: Diarrhea, July 20 to August 4.
- No. 28. Company A: Typhoid fever, July 20; disposition not given.
- No. 29. Company A: Typhoid fever, July 20; furloughed from Leiter Hospital September 7.
- No. 30. Company I: Typhoid fever, July 22 to September 5.
- No. 31. Company K: Typhoid fever, July 23; sent to Fort McPherson July 25; died July 25.
- No. 32. Company B: Diarrhea, July 24; furloughed August 2.
- No. 33. No company: Typhoid fever, July 24; died at Leiter Hospital August 7.
- No. 34. Company I: Typhoid fever, July 24; furloughed from division hospital August 8. This and many other cases in this regiment are marked duty when they were furloughed.
- No. 35. Company D: Diarrhea, July 24; furloughed August 18.
- No. 36. Company C: Without date or diagnosis; sent to division hospital July 25. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.
- No. 37. Company not given: Typhoid fever, July 26; furloughed August 8.
- No. 38. Company H: Diarrhea, July 26; furloughed September 3. In the hospital this case was diagnosed typhoid fever.
- No. 39. Company B: Diarrhea, July 28 to August 29.
- No. 40. Company L: Typhoid fever, July 28; furloughed August 4.
- No. 41. Company G: Intermittent malaria, July 29 to September 17.

- No. 42. Company C: Typhoid fever, July 29 to September 15.
- No. 43. Company F: Intermittent malaria, July 29 to September 16. In the hospital this case was diagnosed typhoid fever.
- No. 44. Company F: Typhoid fever, July 30 to September 5.
- No. 45. Company K: Typhoid fever, August 1; furloughed September 11.
- No. 46. Company G: Diarrhea, August 3 to September 13.
- No. 47. Company H: Diarrhea, August 3 to September 13.
- No. 48. Company H: Diarrhea, August 3 to September 12. In the hospital this case was diagnosed typhoid fever.
- No. 49. Company L: Typhoid fever, August 3; furloughed August 19.
- No. 50. Company F: Without date or diagnosis; sent to division hospital August 4. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 18.
- No. 51. Company B: Intermittent malaria, August 4 to September 15.
- No. 52. Company F: Typhoid fever, August 4; furloughed August 28.
- No. 53. Company I: Remittent malaria, August 4 to September 17.
- No. 54. Company I: Typhoid fever, August 4; died August 14. This case was first diagnosed diarrhea.
- No. 55. Company I: Typhoid fever, August 4 to September 6.
- No. 56. Company G: Diarrhea, August 4; still sick September 30.
- No. 57. Company D: Typhoid fever, August 5; disposition not given.
- No. 58. Company M: Without date or diagnosis; sent to Sternberg Hospital August 5; died August 18.
- No. 59. Company H: Dysentery, August 5 to September 16.
- No. 60. Company C: Without date or diagnosis; sent to Sternberg Hospital August 6. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 30.
- No. 61. Company G: Typhoid fever, August 6; died September 1.
- No. 62. Company F: Typhoid fever, August 6; died August 19.
- No. 63. Company K: Remittent malaria, August 7 to September 17.
- No. 64. Company K: Without date or diagnosis; sent to division hospital August 7. Here the disease was diagnosed typhoid fever, and the patient died. The date of death is not given.
- No. 65. Company K: Intermittent malaria, August 7; furloughed August 22.
- No. 66. Company F: Typhoid fever, August 7; furloughed August 26.
- No. 67. Company K: Typhoid fever, August 7; furloughed August 18.
- No. 68. Company K: Remittent malaria, August 7 to September 17.
- No. 69. Company B: Typhoid fever, August 8; furloughed August 15.
- No. 70. Company M: Intermittent malaria, August 9 to September 19.
- No. 71. Company K: Intermittent malaria, August 9; still sick September 30.
- No. 72. Company F: Intermittent malaria, August 9; still sick September 30.
- No. 73. Company G: Typhoid fever, August 9 to September 13.
- No. 74. Company C: Malaria, August 9 to September 15.
- No. 75. Company L: Diarrhea, August 9 to September 11.
- No. 76. Company L: Diarrhea, August 9; furloughed August 21.
- No. 77. Company I: Remittent malaria, August 10 to September 20.
- No. 78. Company D: Typhoid fever, August 11; disposition not given.
- No. 79. Company H: Diarrhea, August 11 to September 12.
- No. 80. Company G: Intermittent malaria, August 11 to September 18.

No. 81. Company A: Intermittent malaria, August 11; still sick September 30.

No. 82. Company H: Intermittent malaria, August 11 to September 12.

No. 83. Company B: Intermittent malaria, August 11 to September 15.

No. 84. Company B: Typhoid fever, August 11; furloughed August 26.

No. 85. Company M: Diarrhea, August 11; furloughed August 23.

No. 86. Company H: Diarrhea, August 11 to September 12.

No. 87. Company F: Typhoid fever, August 12; furloughed from Sternberg Hospital September 6.

No. 88. Company L: Intermittent malaria, August 12; still sick September 30.

No. 89. Company F: Diarrhea, August 12 to September 16.

No. 90. Company K: Diarrhea, August 12 to September 17.

No. 91. Company L: Intermittent malaria, August 12 to September 24.

No. 92. Company L: Intermittent malaria, August 12 to September 17.

No. 93. Company L: Typhoid fever, August 12 to September 29.

No. 94. Company L: Typhoid fever, August 12; disposition not given.

No. 95. Company L: Indigestion, August 12 to September 15.

No. 96. Company F: Intermittent malaria, August 12 to September 16.

No. 97. Company M: Typhoid fever, August 13; furloughed August 18.

No. 98. Company A: Typhoid fever, August 13; furloughed August 18.

No. 99. Company M: Intermittent malaria, August 13; still sick September 30.

No. 100. Company A: Typhoid fever, August 13; furloughed from division hospital August 26.

No. 101. Company M: Typhoid fever, August 13; disposition not given.

No. 102. Company A: Intermittent malaria, August 13; still sick September 30.

No. 103. Company A: Typhoid fever, August 13; disposition not given.

No. 104. Company A: Intermittent malaria, August 13 to September 14.

No. 105. Company M: Intermittent malaria, August 13 to September 16.

No. 106. Company C: Typhoid fever, August 13; disposition not given.

No. 107. Company E: Intermittent malaria, August 13 to September 15.

No. 108. Company E: Typhoid fever, August 13 to September 15.

No. 109. Company E: Intermittent malaria; sent to Sternberg Hospital August 18. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.

No. 110. Company E: Typhoid fever, August 13 to September 15.

No. 111. Company A: Typhoid fever, August 13; furloughed August 26.

No. 112. Company A: Typhoid fever, August 13; disposition not given.

No. 113. Company K: Indigestion, August 13 to September 17.

No. 114. Company L: Typhoid fever, August 13 to September 17.

No. 115. Company D: Diarrhea, August 13 to September 30.

No. 116. Company A: Intermittent malaria, August 13 to September 18.

No. 117. Company K: Intermittent malaria, August 13 to September 24.

No. 118. Company A: Diarrhea, August 13 to September 15.

No. 119. Company E: Typhoid fever, August 13; furloughed August 26.

No. 120. Company D: Typhoid fever, August 13; died in division hospital August 22.

No. 121. Company G: Typhoid fever, August 13; still sick September 30.

No. 122. Company G: Intermittent malaria, August 13; furloughed August 27.

No. 123. Company G: Typhoid fever, August 13; still sick September 30.

No. 124. Company G: Intermittent malaria, August 13 to September 17.

No. 125. Company C: Typhoid fever, August 13; furloughed August 26.

No. 126. Company A: Intermittent malaria, August 13 to September 18.

No. 127. Company C: Intermittent malaria, August 13 to September 22.

No. 128. Company C: Typhoid fever, August 13; died in division hospital August 26.

No. 129. Company E: Intermittent malaria, August 13 to September 15.

No. 130. Company M: Intermittent malaria, August 13 to September 17.

No. 131. Company A: Remittent malaria, August 13; still sick September 30.

No. 132. Company H: Diarrhea August, 13 to September 12.

No. 133. Company E: Intermittent malaria, August, 13 to September 15.

No. 134. Company A: Typhoid fever, August 13; still sick August 30.

No. 135. Company E: Intermittent malaria, August 13 to September 15.

No. 136. Company L: Intermittent malaria, August 13 to September 17.

No. 137. Company L: Diarrhea, August 13 to September 20.

No. 138. Company G: Diarrhea, August 14 to September 18.

No. 139. Company M: Intermittent malaria, August 14 to September 17.

No. 140. Company E: Diarrhea, August 14; furloughed August 28. In the division hospital this case was diagnosed typhoid fever.

No. 141. Company M: Intermittent malaria, August 14 to September 17.

No. 142. Company D: Diarrhea, August 14 to September 17.

No. 143. Company M: Intermittent malaria, August 14 to September 17.

No. 144. Company D: Remittent malaria, August 14 to September 17.

No. 145. Company H: Without date or diagnosis; sent to Sternberg Hospital August 15. Here the disease was diagnosed typhoid fever, and the patient died August 24.

No. 146. Company C: Without date or diagnosis; sent to division hospital August 15. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 24.

No. 147. Company D: Without date or diagnosis; sent to division hospital August 15. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 22.

No. 148. Company E: Intermittent malaria, August 15 to September 16.

No. 149. Company F: Intermittent malaria, August 15 to September 16.

No. 150. Company B: Diarrhea, August 15 to September 23.

No. 151. Company M: Intermittent malaria, August 15 to September 20.

No. 152. Company B: Without date or diagnosis; sent to division hospital August 15. Here the disease was diagnosed typhoid fever, and the patient died September 2.

No. 153. Company H: Remittent malaria, August 15 to September 16.

No. 154. Company C: Diarrhea, August 15 to September 22. In the hospital this case was diagnosed typhoid fever.

No. 155. Company F: Intermittent malaria, August 15 to September 16.

No. 156. Company F: Intermittent malaria, August 15 to September 20.

No. 157. Company F: Typhoid fever, August 15; still sick September 30.

No. 158. Company A: Intermittent malaria, August 15 to September 16.

No. 159. Company K: Intermittent malaria, August 15; still sick September 30.

No. 160. Company M: Without date or diagnosis; sent to Sternberg Hospital August 15. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 18.

No. 161. Company C: Typhoid fever, August 15; furloughed from Sternberg Hospital September 17.

No. 162. Company I: Remittent malaria, August 16 to September 20.

No. 163. No company: Without date or diagnosis; sent to division hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 26.

No. 164. Company B: Intermittent malaria, August 16 to September 24.

No. 165. Company I: Remittent malaria, August 16 to September 20.

No. 166. Company I: Remittent malaria, August 16 to September 20.

No. 167. Company D: Intermittent malaria, August 16 to September 23.

No. 168. Company L: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 24.

No. 169. Company C: Without date or diagnosis; sent to Sternberg Hospital August 16. Here the disease was diagnosed typhoid fever, and the patient died August 24.

No. 170. Company I: Remittent malaria, August 16 to September 20.

No. 171. Staff: Diarrhea, August 16; died August 22.

No. 172. Company A: Typhoid fever, August 16; furloughed August 28.

No. 173. Company D: Intermittent malaria, August 16 to September 18.

No. 174. Company K: Intermittent malaria, August 16 to September 20.

No. 175. Company A: Diarrhea, August 16; still sick September 30.

No. 176. Company F: Diarrhea, August 16 to September 20.

No. 177. Company F: Typhoid fever, August 17 to September 20.

No. 178. Company F: Typhoid fever, August 17; furloughed August 30.

No. 179. Company C: Intermittent malaria, August 17 to September 22.

No. 180. Company D: Intermittent malaria, August 17 to September 16.

No. 181. Company B: Diarrhea, August 17 to September 23.

No. 182. Company C: Remittent malaria, August 17; still sick September 30.

No. 183. Company H: Typhoid fever, August 17; still sick September 30.

No. 184. Company H: Typhoid fever, August 17 to September 30.

No. 185. Company F: Typhoid fever, August 17; still sick September 30.

No. 186. Company A: Intermittent malaria, August 17; still sick September 30.

No. 187. Company E: Diarrhea, August 18 to September 20.

No. 188. Company G: Intermittent malaria, August 18 to September 18.

No. 189. Company E: Typhoid fever, August 18 to September 20.

No. 190. Company G: Typhoid fever, August 18; died September 2.

No. 191. Company M: Intermittent malaria, August 18; still sick September 30.

No. 192. Company B: Intermittent malaria, August 18; furloughed August 31.

No. 193. Company I: Typhoid fever, August 18; still sick September 30.

No. 194. Company I: Remittent malaria, August 18 to September 17.

No. 195. Company G: Intermittent malaria, August 18 to September 18.

No. 196. Company G: Diarrhea, August 18 to September 18.

No. 197. Company G: Typhoid fever, August 18; still sick September 30.

No. 198. Company F: Typhoid fever, August 18; still sick September 30.

No. 199. Company E: Diarrhea, August 18 to September 24.

No. 200. Company G: Typhoid fever, August 18; still sick September 30.

No. 201. Company G: Typhoid fever, August 18; died in September.

No. 202. Company F: Intermittent malaria, August 18 to September 20.

No. 203. Company H: Diarrhea, August 18 to September 20.

No. 204. Company I: Remittent malaria, August 18 to September 20.

No. 205. Company E: Intermittent malaria, August 18 to September 20. In the hospital this case was diagnosed typhoid fever.

No. 206. Company C: Typhoid fever, August 18; furloughed August 26.

No. 207. Company A: Without date or diagnosis; sent to division hospital August 19. Here the disease was diagnosed typhoid fever, and the patient was furloughed August 26.

No. 208. Company L: Diarrhea, August 19 to September 24.

No. 209. Company D: Intermittent malaria, August 19; still sick September 30.

No. 210. Company A: Intermittent malaria, August 19; still sick September 30.

No. 211. Company B: Intermittent malaria, August 19 to September 23.

No. 212. Company C: Intermittent malaria, August 19 to September 22.

No. 213. Company D: Intermittent malaria, August 19 to September 30.

No. 214. Company C: Diarrhea, August 19 to September 22.

No. 215. Company A: Typhoid fever, August 20 to September 22.

No. 216. Company D: Typhoid fever, August 20; still sick September 30.

No. 217. Company F: Intermittent malaria, August 20 to September 20.

No. 218. Company D: Typhoid fever, August 20; furloughed August 28.

No. 219. Company E: Intermittent malaria, August 20; still sick September 30.

No. 220. Company L: Intermittent malaria, August 21 to September 24.

No. 221. Company K: Intermittent malaria, August 21 to September 24.

No. 222. Company M: Typhoid fever, August 21; still sick September 30.

No. 223. Company E: Typhoid fever, August 22; still sick September 30.

No. 224. Company F: Typhoid fever, August 23; furloughed August 28.

No. 225. Company I: Remittent malaria, August 23 to September 30.

No. 226. Company C: Typhoid fever, August 24 to September 30.
No. 227. Company C: Typhoid fever, August 24 to September 29.
No. 228. Company G: Intermittent malaria, August 24 to September 24.
No. 229. Company F: Intermittent malaria, August 24 to September 30.
No. 230. Company B: Intermittent malaria, August 24 to September 23. In the hospital this case was diagnosed typhoid fever.
No. 231. Company I: Remittent malaria, August 24 to September 24.
No. 232. Company C: Intermittent malaria, August 25 to September 30.
No. 233. Company L: Typhoid fever, August 25; still sick September 30.
No. 234. Company E: Typhoid fever, August 25; still sick August 30.
No. 235. Company I: Typhoid fever, August 25; still sick September 30.
No. 236. Company B: Typhoid fever, August 25 to September 19.
No. 237. Company K: Intermittent malaria, August 25 to September 24.
No. 238. Company D: Malaria, August 25 to September 30.
No. 239. Company B: Typhoid fever, August 26; still sick September 30.
No. 240. Company L: Typhoid fever, August 26; still sick September 30.
No. 241. Company K: Typhoid fever, August 26; still sick September 30.
No. 242. Company I: Typhoid fever, August 26; still sick September 30.
No. 243. Company C: Typhoid fever, August 26; still sick September 30.
No. 244. Company D: Typhoid fever, August 26; still sick September 30.
No. 245. Company I: Without date or diagnosis; sent to division hospital August 27. Here the disease was diagnosed typhoid fever. The further disposition of this patient is not given.
No. 246. Company M: Typhoid fever, August 27; still sick September 30.
No. 247. Company A: Without date or diagnosis; sent to division hospital August 27. Here the disease was diagnosed as undetermined fever, and the patient had not returned to duty September 30.
No. 248. Company L: Diarrhea, August 27 to September 30.
No. 249. Company B: Typhoid fever, August 27 to September 30.
No. 250. Company M: Intermittent malaria, August 27 to September 26.
No. 251. Company K: Diarrhea, August 28 to September 19.
No. 252. Company I: Typhoid fever, August 28; still sick September 30.
No. 253. Company K: Typhoid fever, August 28; still sick September 30.
No. 254. Company H: Intermittent malaria, August 28 to September 27.
No. 255. Company I: Typhoid fever, August 28; still sick September 30.
No. 256. Company L: Diarrhea, August 28 to September 27.
No. 257. Company K: Typhoid fever, August 28; still sick September 30.
No. 258. Company F: Typhoid fever, August 30; still sick September 30.
No. 259. Company D: Typhoid fever, August 30; died September 23.
No. 260. Company E: Typhoid fever, August 30; still sick September 30.
No. 261. Company D: Intermittent malaria, August 30; still sick September 30.

No. 262. Company B: Typhoid fever, August 30; still sick September 30.
No. 263. Company A: Typhoid fever, August 30; died September 5.
No. 264. Company C: Typhoid fever, August 30; still sick September 30.
No. 265. Company H: Typhoid fever, August 30 to September 30.
No. 266. Company L: Typhoid fever, August 30; still sick September 30.
No. 267. Company F: Typhoid fever, August 30; still sick September 30. It is more than probable that many of these cases with the initial date on August 30 really have an earlier initial date. This case illustrates this point. On the regimental record it appears that this man was sent to division hospital August 30; on the hospital record it appears that he was received on August 28.
No. 268. Company G: Intermittent malaria, August 30 to September 30.
No. 269. Company I: Typhoid fever, August 30; still sick September 30.
No. 270. Company H: Typhoid fever, August 30; still sick September 30.
No. 271. Company L: Typhoid fever, August 30; still sick September 30.
No. 272. Company I: Typhoid fever, August 30; still sick September 30.
No. 273. Company B: Intermittent malaria, August 30 to September 30.
No. 274. Company I: Typhoid fever, August 30; still sick September 30.
No. 275. Company F: Typhoid fever, August 30; still sick September 30.
No. 276. Company K: Typhoid fever, August 30; still sick September 30.
No. 277. Company F: Typhoid fever, August 30; still sick September 30.
No. 278. Company M: Typhoid fever, August 30; still sick September 30.
No. 279. Company G: Intermittent malaria, August 30 to September 30.
No. 280. Company G: Intermittent malaria, August 30 to September 30.
No. 281. Company H: Intermittent malaria, August 30 to September 29.
No. 282. Company G: Intermittent malaria, August 30 to September 30.
No. 283. Company L: Intermittent malaria, August 30 to September 30.
No. 284. Company F: Typhoid fever, August 30; died September 2.
No. 285. Company M: Typhoid fever, August 30 to September 30.
No. 286. Company D: Intermittent malaria, August 30; still sick September 30.
No. 287. Company H: Intermittent malaria, August 30 to September 27.
No. 288. Company F: Typhoid fever, August 30; still sick September 30. On the hospital record it appears that this man was sent to division hospital August 17.
No. 289. Company E: Typhoid fever, August 30; still sick September 30.
No. 290. Company H: Typhoid fever, August 30; still sick September 30.
No. 291. Company E: Intermittent malaria, August 30; still sick September 30.
No. 292. Company F: Typhoid fever, August 30; still sick September 30. On the hospital record it appears that this man was

sent to division hospital August 17, and was furloughed August 28.

No. 293. Company H: Typhoid fever, August 30; still sick September 30.

No. 294. Company G: Intermittent malaria, August 30 to September 29.

No. 295. Company H: Intermittent malaria, August 30 to September 29.

No. 296. Company H: Intermittent malaria, August 30 to September 29.

No. 297. Company L: Intermittent malaria, August 30 to September 29.

No. 298. Company K: Typhoid fever, August 30; still sick September 30.

No. 299. Company I: Typhoid fever, August 30; still sick September 30.

No. 300. Company I: Typhoid fever, August 30; still sick September 30. On the hospital record it appears that this man was furloughed August 28.

No. 301. Company L: Typhoid fever, August 31; still sick September 30.

No. 302. Company L: Typhoid fever, August 31; still sick September 30.

No. 303. Company C: Intermittent malaria, August 31 to September 30.

No. 304. Company G: Typhoid fever, August 31; still sick September 30.

No. 305. Company H: Intermittent malaria, August 31 to September 30.

No. 306. Company F: Typhoid fever, August 31 to September 30.

No. 307. Company M: Typhoid fever, August 31; still sick September 30.

No. 308. Company H: Intermittent malaria, August 31 to September 29. In the hospital this case was diagnosed typhoid fever.

No. 309. Company L: Intermittent malaria, August 31 to September 30.

No. 310. Company H: Intermittent malaria, August 31 to September 30.

No. 311. Company L: Typhoid fever, August 31; still sick September 30.

No. 312. Company L: Typhoid fever, August 31; still sick September 30.

No. 313. Company F: Typhoid fever, August 31 to September 30.

No. 314. Company D: Typhoid fever, September 1; still sick September 30.

No. 315. Company A: Typhoid fever, September 1; still sick September 30.

No. 316. Company E: Typhoid fever, September 2; still sick September 30.

No. 317. Company L: Intermittent malaria, September 2; still sick September 30.

No. 318. Company G: Typhoid fever, September 2; still sick September 30.

No. 319. Company L: Intermittent malaria, September 2; still sick September 30.

No. 320. Company L: Intermittent malaria, September 2; still sick September 30.

No. 321. Company E: Typhoid fever, September 3; still sick September 30.

No. 322. Company D: Typhoid fever, September 3; still sick September 30.

No. 323. Company E: Typhoid fever, September 3; still sick September 30.

No. 324. Company D: Typhoid fever, September 3; died September 25.

No. 325. Company E: Intermittent malaria, September 3; still sick September 30.

No. 326. Company I: Typhoid fever, September 4; still sick September 30.

No. 327. Company B: Intermittent malaria, September 4; still sick September 30.

No. 328. Company B: Malaria, September 4; still sick September 30.

No. 329. Company C: Typhoid fever, September 4; still sick September 30.

No. 330. Company I: Typhoid fever, September 5; still sick September 30.

No. 331. Company H: Typhoid fever, September 5; still sick September 30.

No. 332. Company H: Typhoid fever, September 5 to 30.

No. 333. Company B: Intermittent malaria, September 6; still sick September 30.

No. 334. Company G: Typhoid fever, September 6; still sick September 30.

No. 335. Company H: Typhoid fever, September 6; still sick September 30.

No. 336. Company L: Typhoid fever, September 7; still sick September 30.

No. 337. Company L: Typhoid fever, September 7; still sick September 30.

No. 338. Company L: Intermittent malaria, September 7; still sick September 30.

No. 339. Company K: Typhoid fever, September 8; still sick September 30.

No. 340. Company I: Typhoid fever, September 9; still sick September 30.

No. 341. Company I: Typhoid fever, September 9; still sick September 30.

No. 342. Company E: Typhoid fever, September 9; still sick September 30.

No. 343. Company I: Typhoid fever, September 13; still sick September 30.

No. 344. Company M: Typhoid fever, September 16; died September 29.

No. 345. Company D: Typhoid fever, September 23; still sick September 30.

SUMMARY.

Assembled at Camp McKinley near Des Moines, Iowa, April 26, 1898.

Mustered into United States service May 25, 1898.

Arrived at Chickamauga Park, Ga., May 31, 1898.

Strength on arrival, 572.

Date of first case of probable typhoid fever June 8, 1898.

Date of first case of recognized typhoid fever June 8, 1898.

Left Chickamauga Park, Ga., August 28, 1898.

Strength on departure, 1,304.

Number of cases of probable typhoid fever developed at Chickamauga 257

Went from Chickamauga Park, Ga., to Des Moines, Iowa.

Number of cases of probable typhoid fever developed after leaving Chickamauga 88

Total number of cases of probable typhoid fever developed in the Fifty-second Iowa Volunteer Infantry from May to September, 1898..... 345

These 345 cases were diagnosed as follows:

Typhoid fever.....	184
Malaria.....	112
Diarrhea.....	40
Enteritis.....	5
Dysentery.....	1
Indigestion.....	2
Undetermined fever.....	1

Total 345

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Abrams, Harry S.	Pvt., H.	Aug. 21	Chickamauga, Ga.	Typhoid.
Adams, Robert a.	Pvt., M.	Sept. 7	St. Luke's Hospital, Chicago, Ill.	Do.
Bandfield, W.	Pvt., I.	Sept. 17	Boone, Iowa.	Do.
Barkhufl, Gus S.	Pvt., C.	Aug. 22	Camp Thomas, Ga.	Do.
Brophy, John D.	Pvt., D.	Sept. 23	Camp McKinley, Iowa	Do.
Brown, Chas. F.	Sgt., G.	Sept. 8	Fort Dodge, Iowa.	Do.
Buck, Seymour W.	Pvt., G.	Aug. 4	Camp Thomas, Ga.	Do.
Bunger, Bert.	Pvt., G.	Sept. 2	Fort Dodge, Iowa.	Do.
Carroll, Mathew F.	Pvt., M.	Sept. 29	Camp McKinley, Iowa	Do.
Clock, Ned L.	Pvt., D.	Aug. 5	Chattanooga, Tenn.	Do.
Converse, Roy C.	Pvt., M.	Aug. 7	Chickamauga, Ga.	(Typhoid); pernicious malaria.
Cronan, Fred N.	Pvt., F.	Aug. 27	Algona, Iowa.	Typhoid.
Cronin, John W.	Pvt., A.	Sept. 5	Des Moines, Iowa.	Do.
Demo, William O.	Pvt., D.	Sept. 23	Camp McKinley, Iowa	Do.
Duncan, Chas. R.	Corpl., K.	Sept. 9	Camp Thomas, Ga.	Do.
Dutton, Burton R.	Corpl., C.	Sept. 7	Jewell, Iowa.	Do.
Fallrich, Ben W.	Pvt., E.	Sept. 11	Des Moines, Iowa.	Do.
French, John W.	Sgt., D.	July 9	Camp Thomas, Ga.	Do.
Galloway, John A.	Pvt., B.	Oct. 14	Centerville, Iowa.	Do.
Grout, Chas. F.	2d Lt., K.	Sept. 13	Emmetsburg, Iowa.	Do.
Hamilton, J. A.	Pvt., H.	Oct. 4	Sioux City, Iowa.	Do.
Lane, C. E.	Pvt., F.	Sept. 2	Camp McKinley, Iowa	(Typhoid); malarial fever and heart failure.
McDowell, Clinton	Pvt., B.	Aug. 22	.....	Typhoid.
Mowery, William	Pvt., D.	Sept. 2	Camp McKinley, Iowa	Do.
Munn, Frank C.	Corpl., B	Sept. 2	Sternberg Hospital, Chickamauga, Ga.	Do.
Nelson, Eddie E.	Pvt., I.	Aug. 14	Camp Thomas, Ga.	Malarial fever.
Ohge, William A.	Pvt., I.	Sept. 30	Boone, Iowa.	Typhoid.
Packloff, Guy	Pvt., C.	Aug. 24	Sternberg Hospital, Chickamauga, Ga.	Do.
Rifenborg, J. W.	Corpl., G	Aug. 26	Fort Dodge, Iowa.	Do.
Saul, Richard H.	Pvt., G.	Sept. 2	.....	Do.
Skinner, Linn R.	Sgt., band	Aug. 25	Chattanooga, Tenn.	Do.
Stahl, William E.	Wag., F.	Aug. 9	Camp Thomas, Ga.	Do.
Stevens, James E.	Pvt., C.	Aug. 28	Jefferson, Iowa.	Do.
Tracey, William J.	Pvt., E.	Sept. 19	Larchwood, Iowa.	Do.
Watkins, Harry P.	Pvt., M.	Aug. 19	Chickamauga, Ga.	Do.
Winkel, Edgar J.	Pvt., F.	July 29	Fort McPherson, Ga.	Do.
Wilson, Guy M.	Mus., K.	July 25	.....	Do.

a The cause of death in this case was not known until after the percentages had been figured out.

Total deaths..... 37
Deaths due to typhoid fever..... 36

Percentage of deaths among probable cases of typhoid fever (345) 10.43.
Percentage of deaths among recognized cases of typhoid fever (184) 19.56.

COMMUNICATIONS FROM THE SURGEONS OF THE FIFTY-SECOND IOWA VOLUNTEER INFANTRY.

Medical officers.

Andrew C. Bergen, major and surgeon, Sioux City, Iowa.
Van Buren Knott, lieutenant and assistant surgeon, Sioux City, Iowa.
Frank J. Murphy, lieutenant and assistant surgeon, Sioux City, Iowa.

Major Bergen makes the following statement:

This regiment was originally the Fourth Iowa National Guard, and rendezvoused at Camp McKinley, Des Moines, Iowa, on the 26th day of April, 1898, twenty-nine days prior to being mustered into the United States service. Camp McKinley occupied the State fair grounds, the buildings of which were utilized to shelter the four regiments which entered the volunteer service. The water supply of this camp was obtained from a well on the grounds and distributed through pipes by means of a steam pump. It was of good quality.

The sinks were cleaned by scavengers every night, the night soil being hauled in closed vessels and disposed of outside of the camp. Outside of a few mild cases of measles, there was no sickness to speak of at this camp. The general health of the regiment was excellent when it reached Chickamauga Park, Ga.

The regiment in Camp Thomas was located on the southwestern angle formed by the intersection of the Jay's Mill road and the main water-supply pipe, running directly north, about one-half mile northeast of the Vinyard House. There was quite an elevation in the center of the camp, from which the ground sloped three ways. East of the camp the ground sloped upward to a ridge about 400 yards distant. The surface was quite rocky, with large-sized trees, enough to afford considerable shade.

The soil was a hard and nonporous clay, and, when there was enough of it in which to dig a pit, was thrown out in chunks. The digging of sinks for the men was necessarily a difficult task, and their proper care and disinfection was a still greater one. No form of disinfectant was issued to the regiment in any quantity. I think that 1 barrel of quick lime was issued to it during the entire stay at Camp Thomas. Various methods of disinfection were tried, such as burning straw or hay refuse from the corrals in the sinks, on the theory that the heat would destroy flies and their larvae and the ashes would aid in disinfection; but little, if any, effects could be noticed, and the practice was soon abandoned. The dust swept from the camp was the only dirt available for covering the contents of the sinks. Nothing tried seemed to prevent or hinder the multiplication and development of the larvae of the flies in these sinks, where they held high carnival until their wings developed and they could fly over to the mess tables with a good supply of typhoid and other germs. The water used came mostly from the Chickamauga Creek through the supply pipe, and was not by any means ideal, as it was always warm, sometimes hot, and generally muddy. That it contained disease germs in any quantity seems doubtful. Everybody was advised, instructed, and ordered to drink no water that had not been boiled; but the facilities for both boiling and cooling the water were inadequate, rendering the enforcement of such orders difficult. This camp was occupied continuously without striking tents for about ten weeks. Finally a move was made to an open space in the vicinity.

FIRST MISSISSIPPI VOLUNTEER INFANTRY.

Third Brigade, Second Division, Third Army Corps.

This regiment was mustered into service at Camp Patrick Henry, Jackson, Miss., May 26, 1898. It left Jackson May 30, and arrived at Chickamauga Park, Ga., May 31.

Maj. R. L. Turner was in charge. He states:

Owing to the crude condition of the regimental organization, I have been unable to make a report. Our organization was not completed until the last of May. No cases requiring to be excused from duty occurred between dates of muster-in and arrival at Camp Thomas, Chickamauga Park.

The mean strength of the regiment was 995.

The June report is signed by Captain Kittrell, who makes the following statement:

The prevailing diseases have been malarial fever, both remittent and intermittent, measles, acute diarrhea, and some cases of typhoid fever. The cause of the malaria was moving the command from the very low altitude of southern Mississippi to the comparative high altitude of Camp Thomas. The preventative measures adopted have been the free prophylactic use of quinine, each man receiving from 3 to 5 grains daily. All cases of measles have been sent to the isolation ward of the division hospital. The source of the typhoid infection has as yet been undetermined. The measures for the prevention of typhoid fever have been, first, a complete change of water supply; second, a complete change of location of regimental camp. No cases have presented points of special interest and no autopsies have been made.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,003
Typhoid fever	22
Intermittent malaria	93
Remittent malaria	36
Diarrhea	57
Other diseases	67
Total	275

The July report is signed by Assistant Surgeon Bauer, who makes the following statement:

Malarial fever, typhoid fever, and diarrhea are the prevailing diseases. In my opinion the cause of the malarial fever is due to the bad location of the camp; the typhoid fever is due mostly to water; the diarrhea, to water and change of diet. The camp has been moved to a better location. All water is now being boiled and filtered. The sanitary conditions are much better, and we now get good sunlight, and I think that the health of the regiment will improve.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,074
Typhoid fever	28
Diarrhea	166
Intermittent malaria	234
Remittent malaria	66
Dysentery	4
Undetermined fever	3
Other diseases	279
Total	780

In the August report Acting Surgeon Bauer makes the following statement:

The prevailing diseases have been typhoid fever, malarial fever, diarrhea, and jaundice. Bad water and bad air, caused by crowding on so small a place so many men, without proper means of keeping everything clean, are regarded as the causes.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength not given.	
Typhoid fever	32
Intermittent malaria	171
Remittent malaria	172
Diarrhea	187
Dysentery	10
Undetermined fever	8
Other diseases	179
Total	759

In the September report Asst. Surg. Francis M. Shepherd in charge makes the following statement:

The prevailing diseases are malarial fever and jaundice, probably caused by too many men being crowded into Chickamauga Park. This regiment left Chickamauga September 8 and went to Lauderdale, Miss. It was granted thirty days' furlough on account of sickness.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	693
Intermittent malaria	67
Remittent malaria	31
Diarrhea	34
Dysentery	4

Typhoid fever	6
Jaundice	56
Other diseases	45
Total	243

The following is a list of the recognized and probable cases of typhoid fever in this regiment:

- No. 1. Company C: Typhoid fever, June 1; sent to Fort McPherson June 28; furloughed August 23.
- No. 2. Company B: Malaria, June 1; sent to Fort McPherson June 28; returned to duty July 12. At Fort McPherson this case was diagnosed typhoid fever.
- No. 3. Company K: Typhoid fever, June 1 to 24.
- No. 4. Company H: Typhoid fever, June 3; died in division hospital June 26.
- No. 5. Company L: Malaria, June 4; died in Leiter Hospital June 27. In hospital this case was diagnosed typhoid fever.
- No. 6. Company F: Malaria, June 5; furloughed August 5.
- No. 7. Company H: Typhoid fever, June 5; furloughed August 15.
- No. 8. Company L: Typhoid fever, June 6. There is no further record of this man, except that he was sent to division hospital June 16.
- No. 9. Company L: Typhoid fever, June 7; furloughed from division hospital July 26.
- No. 10. Company M: Malaria, June 8; furloughed from division hospital July 22.
- No. 11. Company M: Malaria, June 8 to 21.
- No. 12. Company K: Typhoid fever, June 10; furloughed from Leiter Hospital July 23.
- No. 13. Company K: Typhoid fever, June 13; furloughed from division hospital August 2.
- No. 14. Company M: Diarrhea, June 13 to July 1.
- No. 15. Company D: Malaria, June 13 to July 2.
- No. 16. Company K: Typhoid fever, June 14; furloughed from division hospital August 1.
- No. 17. Company L: Typhoid fever, June 15; died in Leiter Hospital July 10.
- No. 18. Company L: Typhoid fever, June 15; died in division hospital July 5.
- No. 19. Company K: Typhoid fever, June 15; furloughed from division hospital July 5. This man is recorded as having had malaria from June 12 to 15. This shows that his initial date for typhoid fever was June 12 instead of June 15.
- No. 20. Company K: Typhoid fever, June 15; furloughed from Leiter Hospital July 23.
- No. 21. Company H: Malaria, June 15 to July 5.
- No. 22. Company A: Malaria, June 16 to 27.
- No. 23. Company D: Typhoid fever, June 17; furloughed July 27.
- No. 24. Company D: Typhoid fever, June 17. This man was sent to the division hospital June 17, and there is no further record of him.
- No. 25. Company E: Typhoid fever, June 17 to August 11.
- No. 26. Company I: Malaria, June 18 to 28.
- No. 27. Company F: Malaria, June 18 to 28.
- No. 28. Company L: Malaria, June 19; furloughed from division hospital July 26.
- No. 29. Company H: Typhoid fever, June 19; furloughed from division hospital July 28.
- No. 30. Company not given: Malaria, June 20; furloughed August 31.
- No. 31. Company E: Malaria, June 20; still sick in division hospital August 31.
- No. 32. Company E: Malaria, June 20 to 30.
- No. 33. Staff: Typhoid fever, June 20; still sick July 31.
- No. 34. Company H: Typhoid fever, June 21; furloughed from division hospital July 27.
- No. 35. Company H: Typhoid fever, June 21; furloughed from division hospital June 27.

- No. 36. Company B: Malaria, June 21 to August 10.
 No. 37. Company D: Malaria, June 22 to July 24.
 No. 38. Company K: Typhoid fever, June 23; furloughed from Leiter Hospital August 11.
 No. 39. Company K: Malaria, June 23; furloughed from division hospital August 5.
 No. 40. Company D: Malaria, June 24 to July 6.
 No. 41. Company G: Malaria, June 24 to July 26.
 No. 42. Company G: Malaria, June 24 to July 9.
 No. 43. Company B: Typhoid fever, June 24; furloughed from division hospital August 15.
 No. 44. Company C: Malaria, June 25; furloughed August 28.
 No. 45. Company M: Typhoid fever, June 25; furloughed from division hospital July 27.
 No. 46. Company D: Typhoid fever, June 26; furloughed from division hospital July 27.
 No. 47. Company D: Typhoid fever, June 26 to July 17.
 No. 48. Company A: Typhoid fever, June 27; died in Leiter Hospital July 4.
 No. 49. Company C: Typhoid fever, June 28; furloughed from division hospital July 31.
 No. 50. Company L: Typhoid fever, June 29; sent to Fort McPherson July 25; died July 26.
 No. 51. Staff: Typhoid fever, June 30; furloughed August 3.
 No. 52. Company D: Malaria, June 30; still sick in division hospital July 31.
 No. 53. Company A: Malaria, June 30 to July 10.
 No. 54. Company E: Malaria, July 1; still sick July 31.
 No. 55. Company A: Malaria, July 1 to 30.
 No. 56. Company A: Malaria, July 2 to 27.
 No. 57. Company G: Typhoid fever, July 2 to August 5.
 No. 58. Company K: Malaria, July 2 to 25.
 No. 59. Company F: Malaria, July 3 to 15.
 No. 60. Company K: Malaria, July 3 to 23.
 No. 61. Company K: Malaria, July 4 to September 5. This man is recorded as having had malaria from June 12 to 15.
 No. 62. Company I: Malaria, July 5 to 22.
 No. 63. Company M: Typhoid fever, July 6; died September 11.
 No. 64. Company C: Malaria, July 7 to 17.
 No. 65. Company A: Malaria, July 7 to 29.
 No. 66. Company C: Malaria, July 10 to 31.
 No. 67. Company M: Malaria, July 10; furloughed August 9.
 No. 68. Company F: Malaria, July 10 to 30.
 No. 69. Company C: Malaria, July 14; still sick in division hospital August 31.
 No. 70. Company G: Malaria, July 14 to August 1.
 No. 71. Company M: Malaria, July 14 to August 19.
 No. 72. Company I: Malaria, July 15; still sick July 31.
 No. 73. Company C: Malaria, July 15; still sick in division hospital July 31.
 No. 74. Company A: Malaria July 15; still sick in hospital July 31.
 No. 75. Company I: Malaria, July 15 to August 15.
 No. 76. Company G: Typhoid fever, July 15; furloughed from division hospital October 4.
 No. 77. Company K: Malaria, July 15 to August 6.
 No. 78. Company C: Typhoid fever, July 16; furloughed from division hospital September 11.
 No. 79. Company C: Malaria, July 16; furloughed August 27.
 No. 80. Company K: Typhoid fever, July 16; furloughed August 4.
 No. 81. Company K: Typhoid fever, July 18; died in Leiter Hospital July 28.
 No. 82. Company M: Malaria, July 19; still sick July 31.
 No. 83. Company M: Malaria, July 19 to August 20.
 No. 84. Company K: Malaria, July 19; furloughed August 22.
 No. 85. Company G: Malaria, July 20; still sick in hospital August 19. In hospital this diagnosis was changed to typhoid fever.
 No. 86. Company B: Malaria, July 20; furloughed August 15. In hospital this diagnosis was changed to typhoid fever.
 No. 87. Company I: Malaria, July 20; still sick in hospital July 31.
 No. 88. Company K: Malaria, July 22; furloughed August 1.
 No. 89. Company M: Malaria, July 22 to August 18.
 No. 90. Company G: Typhoid fever, July 22; furloughed from division hospital August 22.
 No. 91. Company F: Malaria, July 22; died in Leiter Hospital August 15. In hospital this diagnosis was changed to typhoid fever.
 No. 92. Company M: Malaria, July 23; furloughed August 5.
 No. 93. Company L: Malaria, July 23; furloughed July 29.
 No. 94. Company I: Malaria, July 24; furloughed August 3.
 No. 95. Company D: Typhoid fever, July 25; furloughed from division hospital August 19.
 No. 96. Company K: Malaria, July 25; still sick in division hospital August 19.
 No. 97. Company F: Malaria, July 26; furloughed August 5.
 No. 98. Company L: Malaria, July 26; furloughed August 22.
 No. 99. Company A: Typhoid fever, July 26; died August 12.
 No. 100. Company I: Malaria, July 26; furloughed August 21.
 No. 101. Company K: Typhoid fever, July 27; disposition not given.
 No. 102. Company K: Malaria, July 28; furloughed August 18.
 No. 103. Company M: Typhoid fever, July 28; sent to division hospital July 31. There is no further record of this case.
 No. 104. Company F: Malaria, July 28; furloughed August 5.
 No. 105. Company K: Malaria, July 28; furloughed August 8.
 No. 106. Company G: Malaria, July 28; furloughed August 22.
 No. 107. Company M: Malaria, July 29; furloughed August 23.
 No. 108. Company D: Typhoid fever, July 29; furloughed August 5.
 No. 109. Company F: Malaria, July 29; furloughed August 22.
 No. 110. Company K: Malaria, July 29; furloughed August 22.
 No. 111. Company F: Malaria, July 29 to August 18.
 No. 112. Company H: Malaria, July 30; still sick in hospital August 31.
 No. 113. Company E: Malaria, July 30; furloughed August 14.
 No. 114. Company M: Malaria, July 30 to August 13.
 No. 115. Company K: Malaria, July 30; furloughed August 5.
 No. 116. Company B: Malaria, July 30; furloughed August 27.
 No. 117. Company E: Malaria, July 30; furloughed August 15.
 No. 118. Company B: Malaria, July 30 to September 10.
 No. 119. Company F: Malaria, July 31 to August 25.
 No. 120. Company B: Malaria, July 31 to August 18.
 No. 121. Company E: Malaria, July 31; still sick in division hospital August 31.
 No. 122. Company G: Typhoid fever, July 31; died in Sternberg Hospital August 31.
 No. 123. Company B: Malaria, July 31; furloughed August 22.
 No. 124. Company K: Malaria, August 1; furloughed August 6.
 No. 125. Company B: Malaria, August 1 to 24.
 No. 126. Company A: Malaria, August 1 to 29.
 No. 127. Company H: Typhoid fever, August 1; still sick in Leiter Hospital August 31.
 No. 128. Company F: Malaria, August 2; furloughed from division hospital August 22. In hospital this case was diagnosed typhoid fever.
 No. 129. Company C: Typhoid fever, August 2; furloughed August 15.
 No. 130. Company F: Malaria, August 2; still sick in division hospital August 31.
 No. 131. Company F: Malaria, August 2; still sick in division hospital August 31.
 No. 132. Company A: Malaria, August 2 to 14.
 No. 133. Company I: Malaria, August 3 to 16.
 No. 134. Company A: Malaria, August 3; furloughed August 22.
 No. 135. Company D: Malaria, August 3 to 13.

- No. 136. Company H: Malaria, August 3; furloughed August 22.
- No. 137. Company C: Malaria, August 4 to 17.
- No. 138. Company G: Malaria, August 5; still sick in division hospital August 31.
- No. 139. Company M: Malaria, August 5; still sick in division hospital August 31.
- No. 140. Company B: Malaria, August 5 to 22.
- No. 141. Company B: Malaria, August 5; still sick in Sternberg Hospital August 31.
- No. 142. Company I: Malaria, August 5; furloughed August 22.
- No. 143. Company B: Malaria, August 5; furloughed August 22.
- No. 144. Company K: Remittent malaria, August 5 to 16.
- No. 145. Company K: Malaria, August 6; still sick in division hospital August 31.
- No. 146. Company C: Malaria, August 6; furloughed August 15.
- No. 147. Company E: Typhoid fever, August 6; furloughed August 11.
- No. 148. Company A: Typhoid fever, August 6; furloughed August 19.
- No. 149. Company E: Typhoid fever, August 7; furloughed from division hospital August 17.
- No. 150. Company B: Malaria, August 7 to 26.
- No. 151. Company E: Malaria, August 7; furloughed August 15.
- No. 152. Company C: Malaria, August 7; furloughed August 22.
- No. 153. Company H: Typhoid fever, August 7; sent to division hospital August 7; further disposition not given.
- No. 154. Company L: Malaria, August 8; furloughed August 22.
- No. 155. Company B: Diarrhea, August 8; furloughed August 22.
- No. 156. Company B: Malaria, August 8; furloughed August 22.
- No. 157. Company L: Typhoid fever, August 8; furloughed August 21.
- No. 158. Company K: Malaria, August 8 to 30.
- No. 159. Company I: Malaria, August 9; furloughed August 22.
- No. 160. Company L: Malaria, August 9; still sick in division hospital August 31. In hospital this case was diagnosed typhoid fever.
- No. 161. Company I: Malaria, August 9; still sick in division hospital August 31.
- No. 162. Company F: Malaria, August 9; furloughed from division hospital August 24.
- No. 163. Company K: Malaria, August 9; furloughed August 18.
- No. 164. Company M: Malaria, August 9; still sick September 30.
- No. 165. Company G: Typhoid fever, August 10; furloughed from Sternberg Hospital October 24.
- No. 166. Company E: Malaria, August 10; furloughed from division hospital August 26.
- No. 167. Company I: Malaria, August 10; furloughed August 22.
- No. 168. Company C: Malaria, August 10; furloughed August 15.
- No. 169. Company L: Malaria, August 10; still sick in division hospital August 31.
- No. 170. Company H: Malaria, August 11; furloughed August 22.
- No. 171. Company I: Malaria, August 11; furloughed August 21.
- No. 172. Company E: Malaria, August 11; furloughed August 22.
- No. 173. Company B: Malaria, August 11; furloughed August 22.
- No. 174. Company G: Malaria, August 12; furloughed August 22.
- No. 175. Company B: Malaria, August 12; furloughed August 22.
- No. 176. Company H: Malaria, August 12; still sick in hospital August 31.
- No. 177. Company A: Malaria, August 12; furloughed August 22. In hospital this case was diagnosed typhoid fever.
- No. 178. Company B: Malaria, August 12 to 26.
- No. 179. Company B: Malaria, August 12; still sick in division hospital August 31.
- No. 180. Company H: Malaria, August 12; furloughed August 22.
- No. 181. Company K: Typhoid fever, August 12; still sick in division hospital August 31.
- No. 182. Company C: Malaria, August 12; furloughed August 15.
- No. 183. Company K: Malaria, August 13; still sick in division hospital August 31.
- No. 184. Company B: Typhoid fever, August 13; furloughed August 22.
- No. 185. Company A: Malaria, August 13; furloughed August 22.
- No. 186. Company C: Jaundice, August 13 to September 5.
- No. 187. Company G: Malaria, August 13; furloughed from division hospital August 22.
- No. 188. Company A: Malaria, August 13; furloughed from division hospital August 26.
- No. 189. Company D: Malaria, August 13; furloughed from division hospital August 28.
- No. 190. Company C: Malaria, August 13; furloughed August 22.
- No. 191. Company I: Malaria, August 13; furloughed from division hospital August 22.
- No. 192. Company G: Malaria, August 13; still sick in division hospital August 31.
- No. 193. Company G: Malaria, August 13; still sick in division hospital August 31.
- No. 194. Company A: Malaria, August 14 to 24.
- No. 195. Company H: Malaria, August 14; furloughed from division hospital August 26.
- No. 196. Company C: Malaria, August 14; furloughed from division hospital August 22.
- No. 197. Company A: Malaria, August 14; furloughed August 22.
- No. 198. Company K: Malaria, August 14; furloughed August 26.
- No. 199. Company F: Malaria, August 14; furloughed from division hospital October 3. In hospital this case was diagnosed typhoid fever.
- No. 200. Company L: Malaria, August 14; still sick in division hospital August 31.
- No. 201. Company A: Malaria, August 14; furloughed August 24.
- No. 202. Company H: Malaria, August 14; still sick in division hospital August 31.
- No. 203. Company H: Typhoid fever, August 14; furloughed from division hospital August 22.
- No. 204. Company F: Malaria, August 14; still sick in division hospital August 31.
- No. 205. Company C: Malaria, August 15; still sick in division hospital August 31.
- No. 206. Company M: Undetermined fever, August 15; furloughed from division hospital August 28.
- No. 207. Company C: Jaundice, August 15 to September 2.
- No. 208. Company B: Typhoid fever, August 15; died in Sternberg Hospital August 18.
- No. 209. Company L: Malaria, August 15; furloughed from division hospital August 26.
- No. 210. Company A: Malaria, August 15; furloughed August 22.
- No. 211. Company E: Malaria, August 15; still sick in division hospital August 31.
- No. 212. Company A: Malaria, August 15; still sick in division hospital August 31.
- No. 213. Company E: Malaria, August 15; furloughed from division hospital August 22.
- No. 214. Company G: Malaria, August 15; still sick in division hospital August 31. This man is recorded as having had diarrhea July 15 to August 10. It is more likely that he had typhoid fever, the initial date of which should be July 15.
- No. 215. Company A: Malaria, August 15; still sick in division hospital August 31.
- No. 216. Company C: Malaria, August 15; furloughed August 24.
- No. 217. Company E: Typhoid fever, August 15; furloughed from division hospital August 22.
- No. 218. Company C: Malaria, August 16; furloughed from division hospital August 30.
- No. 219. Company G: Malaria, August 16; still sick in division hospital August 31.
- No. 220. Company M: Malaria, August 16; furloughed August 22.
- No. 221. Company L: Malaria, August 16; furloughed August 22.
- No. 222. Company D: Malaria, August 16; furloughed from division hospital August 22.

- No. 223. Company L: Malaria, August 16 to September 12.
- No. 224. Company D: Malaria, August 16; died in division hospital August 25. After death the diagnosis was changed to typhoid fever.
- No. 225. Company C: Malaria, August 16; still sick in division hospital August 31.
- No. 226. Company A: Malaria, August 17; still sick in division hospital August 31.
- No. 227. Company A: Malaria, August 17; furloughed from division hospital August 22.
- No. 228. Company C: Malaria, August 17; furloughed from division hospital August 22.
- No. 229. Company A: Malaria, August 17; furloughed August 23.
- No. 230. Company L: Malaria, August 17; furloughed August 22.
- No. 231. Company C: Malaria, August 17; furloughed from division hospital August 22.
- No. 232. Company L: Malaria, August 17; died in division hospital September 3.
- No. 233. Company A: Typhoid fever, August 17; furloughed from division hospital August 26.
- No. 234. Company H: Malaria, August 17 to September 15.
- No. 235. Company E: Malaria, August 17; furloughed August 23.
- No. 236. Company B: Malaria, August 18; furloughed from division hospital October 22. In hospital this case was diagnosed typhoid fever.
- No. 237. Company B: Malaria, August 18; furloughed August 20.
- No. 238. Company B: Malaria, August 18; furloughed August 24.
- No. 239. Company E: Malaria, August 18; still sick in division hospital August 31.
- No. 240. Company B: Malaria, August 18; furloughed from division hospital August 26.
- No. 241. Company L: Malaria, August 18; furloughed August 22.
- No. 242. Company B: Malaria, August 18; furloughed from division hospital August 31.
- No. 243. Company G: Jaundice, August 18 to September 5.
- No. 244. Company D: Malaria, August 18 to September 1.
- No. 245. Company M: Malaria, August 18; still sick in division hospital August 31.
- No. 246. Company L: Malaria, August 18 to September 3.
- No. 247. Company L: Malaria, August 18; furloughed August 28.
- No. 248. Company L: Malaria, August 19; furloughed August 28.
- No. 249. Company B: Malaria, August 19; still sick in division hospital August 31.
- No. 250. Company H: Malaria, August 19; furloughed from division hospital August 30.
- No. 251. Band: Malaria, August 19; still sick in division hospital August 31.
- No. 252. Company H: Malaria, August 19; furloughed from division hospital August 29.
- No. 253. Company G: Malaria, August 19; furloughed August 22.
- No. 254. Company H: Jaundice, August 19 to September 15.
- No. 255. Company K: Malaria, August 20; furloughed August 25.
- No. 256. Company G: Malaria, August 20; furloughed from division hospital September 1.
- No. 257. Company B: Malaria, August 20; furloughed August 28.
- No. 258. Company B: Malaria, August 21; furloughed August 30.
- No. 259. Company C: Malaria, August 21; furloughed August 24.
- No. 260. Company K: Malaria, August 21; furloughed August 27.
- No. 261. Company L: Malaria, August 21; furloughed from division hospital August 30.
- No. 262. Company B: Malaria, August 21; furloughed August 22.
- No. 263. Company F: Malaria, August 21; furloughed from division hospital September 1.
- No. 264. Company D: Malaria, August 21; furloughed from division hospital September 1. In hospital this diagnosis was changed to typhoid fever.
- No. 265. Company B: Malaria, August 21; furloughed August 26.
- No. 266. Company F: Malaria, August 21; furloughed August 26.
- No. 267. Band: Malaria, August 21; furloughed September 3.
- No. 268. Company F: Malaria, August 21; still sick in division hospital August 31.
- No. 269. Company I: Malaria, August 21; furloughed August 28.
- No. 270. Company B: Malaria, August 21; still sick in division hospital August 31.
- No. 271. Company A: Malaria, August 21; furloughed August 26.
- No. 272. Company M: Malaria, August 22; still sick in division hospital August 31.
- No. 273. Company M: Malaria, August 22; furloughed from division hospital August 28.
- No. 274. Company L: Typhoid fever, August 22; furloughed from Sternberg Hospital August 28.
- No. 275. Company C: Malaria, August 22 to September 10.
- No. 276. Company A: Typhoid fever, August 22; disposition not given.
- No. 277. Company C: Malaria, August 22; furloughed August 25.
- No. 278. Company I: Malaria, August 22; furloughed August 23.
- No. 279. Company K: Malaria, August 22; furloughed August 29.
- No. 280. Company B: Jaundice, August 22 to September 12.
- No. 281. Company B: Malaria, August 22; furloughed from division hospital August 29. In hospital this case was diagnosed typhoid fever.
- No. 282. Company G: Malaria, August 22; furloughed August 28.
- No. 283. Company G: Malaria, August 22; furloughed August 27.
- No. 284. Company A: Malaria, August 22; furloughed August 28.
- No. 285. Company F: Malaria, August 22; still sick in division hospital August 31.
- No. 286. Company F: Malaria, August 23 to September 11.
- No. 287. Company E: Malaria, August 23; still sick September 30.
- No. 288. Company F: Malaria, August 23; furloughed August 28.
- No. 289. Company H: Malaria, August 23; still sick in division hospital September 30.
- No. 290. Company M: Typhoid fever, August 23; furloughed from Leiter Hospital October 9.
- No. 291. Company M: Diarrhea, August 23 to September 16.
- No. 292. Company G: Typhoid fever, August 23; furloughed from division hospital September 1.
- No. 293. Company E: Malaria, August 23; still sick in division hospital September 30.
- No. 294. Company G: Malaria, August 23; furloughed from division hospital October 23. In hospital this case was diagnosed typhoid fever.
- No. 295. Company A: Malaria, August 23 to September 16.
- No. 296. Company B: Malaria, August 23; furloughed from division hospital August 28.
- No. 297. Company H: Malaria, August 23; furloughed from division hospital August 29.
- No. 298. Company K: Malaria, August 23; furloughed from division hospital August 28.
- No. 299. Company E: Malaria, August 24; furloughed from division hospital August 28. In hospital this case was diagnosed typhoid fever.
- No. 300. Company E: Malaria, August 24; furloughed from division hospital August 31.
- No. 301. Company G: Malaria, August 24; furloughed September 5.
- No. 302. Company E: Malaria, August 24; still sick in division hospital September 30.
- No. 303. Company F: Malaria, August 24; still sick in division hospital September 30. In hospital this case was diagnosed typhoid fever.
- No. 304. Company I: Malaria, August 24 to September 12.
- No. 305. Company M: Malaria, August 24; furloughed from division hospital.
- No. 306. Company C: Malaria, August 24; furloughed September 5.
- No. 307. Company H: Malaria, August 24; furloughed from division hospital August 29.

No. 308. Company M: Malaria, August 25; furloughed from division hospital August 28.

No. 309. Company L: Malaria, August 25; furloughed from division hospital August 28.

No. 310. Company K: Malaria, August 25; furloughed from division hospital September 3.

No. 311. Company I: Malaria, August 25; furloughed September 5.

No. 312. Company M: Malaria, August 25; still sick in division hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 313. Company G: Malaria, August 25; still sick in division hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 314. Company B: Malaria, August 25; furloughed August 30.

No. 315. Company E: Malaria, August 25; furloughed from division hospital September 8. In hospital this case was diagnosed typhoid fever.

No. 316. Company M: Diarrhea, August 25 to September 16.

No. 317. Company E: Malaria, August 26; furloughed August 27. This man was sent to hospital July 26 with a diagnosis of remittent malaria, and was returned to sick quarters August 5. There is no evidence that he returned between August 5 and 26.

No. 318. Company M: Malaria, August 26 to September 16.

No. 319. Company B: Malaria, August 26 to September 10.

No. 320. Company M: Diarrhea, August 26 to September 16.

No. 321. Company K: Malaria, August 26; furloughed August 31. This man was reported with diarrhea July 30, and there is no record of his having been returned to duty.

No. 322. Company I: Malaria, August 26; furloughed from division hospital August 29.

No. 323. Company H: Malaria, August 26; furloughed August 27.

No. 324. Company F: Malaria, August 26; furloughed from division hospital August 29.

No. 325. Company M: Jaundice, August 26 to September 16.

No. 326. Company K: Malaria, August 26; furloughed from division hospital August 31. This man is recorded as having had dysentery August 20 to 22.

No. 327. Company K: Malaria, August 26; furloughed August 31.

No. 328. Company K: Malaria, August 26; furloughed September 3.

No. 329. Company B: Malaria, August 26; still sick in division hospital September 30.

No. 330. Company M: Diarrhea, August 26 to September 16.

No. 331. Company A: Malaria, August 26; furloughed September 2.

No. 332. Company H: Malaria, August 27; furloughed from division hospital November 5. In hospital this case was diagnosed typhoid fever.

No. 333. Company A: Malaria, August 27; furloughed August 28.

No. 334. Company A: Malaria, August 27; sent to Leiter Hospital September 3.

No. 335. Company B: Typhoid fever, August 27; furloughed September 1.

No. 336. Company H: Malaria, August 27; furloughed September 1.

No. 337. Company C: Jaundice, August 27; furloughed September 5.

No. 338. Company D: Typhoid fever, August 27; disposition not given.

No. 339. Company K: Malaria, August 28; still sick in division hospital September 30.

No. 340. Company K: Jaundice, August 28 to September 14.

No. 341. Company C: Malaria, August 28; furloughed September 4.

No. 342. Company A: Diarrhea, August 28; sent to Leiter Hospital September 3. This man is recorded as having had diarrhea June 23 and 24.

No. 343. Company L: Malaria, August 28; furloughed September 7.

No. 344. Company D: Undetermined fever, August 28; still sick in division hospital September 30.

No. 345. Company C: Malaria, August 28; furloughed August 31.

No. 346. Company K: Malaria, August 29; furloughed from division hospital August 31.

No. 347. Company E: Malaria, August 29 to September 12.

No. 348. Company E: Malaria, August 29; still sick in division hospital September 30. In hospital this case was diagnosed typhoid fever.

No. 349. Company H: Malaria, August 29; still sick in division hospital September 30.

No. 350. Company F: Diarrhea, August 29 to September 15.

No. 351. Company K: Malaria, August 29; furloughed August 31.

No. 352. Company B: Malaria, August 29; still sick in division hospital September 30.

No. 353. Company K: Malaria, August 29; furloughed August 31.

No. 354. Company B: Malaria, August 29; still sick in division hospital September 30.

No. 355. Company H: Typhoid fever, August 30; furloughed from Sternberg Hospital October 20.

No. 356. Company I: Malaria, August 30; furloughed from division hospital September 3.

No. 357. Company C: Malaria, August 30; furloughed September 4.

No. 358. Company H: Typhoid fever, August 30; sent to division hospital August 30. Further disposition not given.

No. 359. Company F: Malaria, August 30; furloughed September 11.

No. 360. Company M: Typhoid fever, August 31; furloughed from Sternberg Hospital September 3.

No. 361. Company H: Jaundice, August 31 to September 15.

No. 362. Company B: Malaria, August 31; furloughed September 6.

No. 363. Company E: Malaria, August 31; furloughed September 11.

No. 364. Company K: Typhoid fever, August 31; furloughed from Sternberg Hospital October 4.

No. 365. Company M: Typhoid fever, August 31; furloughed from Sternberg Hospital October 19.

No. 366. Company D: Malaria, August 31; furloughed from division hospital October 8. In hospital this case was diagnosed typhoid fever.

No. 367. Company D: Malaria, August 31; still sick in division hospital September 31.

No. 368. Company D: Typhoid fever, August 31; died in Sternberg Hospital October 5.

No. 369. Company B: Malaria, September 1 to 10.

No. 370. Company C: Malaria, September 1 to 20.

No. 371. Company H: Malaria, September 1 to 15.

No. 372. Company I: Malaria, September 1; still sick in division hospital September 30.

No. 373. Company F: Malaria, September 1; furloughed September 5.

No. 374. Company I: Malaria, September 3; furloughed from hospital September 15.

No. 375. Company H: Malaria, September 3; furloughed from hospital September 13.

No. 376. Company G: Malaria, September 3; furloughed September 5. This man had malaria June 15 to 20.

No. 377. Company L: Typhoid fever, September 3; furloughed September 30.

No. 378. Company F: Malaria, September 3 to 15. This man is recorded as having had malaria July 15 to 30.

No. 379. Company F: Malaria, September 3 to 14.

No. 380. Company B: Malaria, September 4; furloughed September 6.

- No. 381. Company K: Malaria, September 4; still sick September 30.
- No. 382. Company G: Malaria, September 4 to 16.
- No. 383. Company G: Malaria, September 4 to 16.
- No. 384. Company H: Malaria, September 4 to 15.
- No. 385. Company H: Diarrhea, September 4; furloughed September 6.
- No. 386. Company L: Malaria, September 4 to 15.
- No. 387. Company M: Malaria, September 5; still sick September 30.
- No. 388. Company G: Typhoid fever, September 8; furloughed from Sternberg Hospital October 2.
- No. 389. Company A: Malaria, September 10; furloughed September 14.
- No. 390. Company M: Typhoid fever, September 10; furloughed September 30.
- No. 391. Company M: Typhoid fever, September 10; furloughed October 15.
- No. 392. Company M: Typhoid fever, September 10; furloughed September 30.
- No. 393. Company M: Typhoid fever, September 12; furloughed from Sternberg Hospital September 27.
- No. 394. Company B: Malaria, September 15 to 30.
- No. 395. Company E: Malaria, October 12 to November 6.
- No. 396. Company H: Typhoid fever, October 12; furloughed October 18.
- No. 397. Company K: Typhoid fever, November 1; furloughed November 16.

SUMMARY.

Assembled at Camp Patrick Henry, near Jackson, Miss., in May, 1898.

Mustered into United States service May 26, 1898.

Arrived at Chickamauga Park, Ga., May 31, 1898.

Strength on arrival, 995.

Date of first case of probable typhoid fever, June 1, 1898.

Date of first case of recognized typhoid fever, June 1, 1898.

Left Chickamauga Park, Ga., September 8, 1898.

Strength on departure, 1,029.

Number of cases of probable typhoid fever developed at Chickamauga 388

Went from Chickamauga Park, Ga., to Lauderdale, Miss., and was here disbanded on furlough.

Number of cases of probable typhoid fever developed after leaving Chickamauga 9

Total number of cases of probable typhoid fever developed in the First Mississippi Volunteer Infantry from May to November, 1898..... 397

These 397 cases were diagnosed as follows:

Typhoid fever.....	98
Malaria.....	279
Diarrhea.....	9
Jaundice.....	9
Undetermined fever.....	2
Total.....	397

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Allen, William (1st).....	Pvt., F.	Aug. 29	Sterns Creek, Miss.....	Typhoid.
Anderson, L. R.....	Pvt., C.	Oct. 23	Natches, Miss.....	Yellow fever.
Brown, Felix F.....	Pvt., G.	Aug. 31	Hazelhurst, Miss.....	Typhoid.
Cavanah, Wiley B.....	Artif., E.	Sept. 27	.....	Do.
Chambass, Sol.....	Pvt., L.	July 4	Camp Thomas, Ga.....	Do.
Cogan, Carroll F.....	Pvt., B.	Sept. 15	Stonington, Miss.....	Do.

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Cowart, Homer G.....	Pvt., L.	July 10	Leiter Hospital, Ga.....	Typhoid.
Edmandson, W. J.....	Pvt., B.	Aug. 17	Chickamauga, Ga.....	Do.
Gentry, John F.....	Pvt., F.	Aug. 15	Camp Thomas, Ga.....	Do.
Godwin, Lovett H.....	Pvt., L.	Sept. 25	Reiderville, Ala.....	Cerebro-spinal meningitis.
Gibson, Merry E.....	Pvt., A.	Aug. 24	Vicksburg, Miss.....	Typhoid.
Hamilton, E. S.....	Pvt., A.	June 26	Camp Thomas, Ga.....	Do.
Harrington, B. M.....	Hos. std.	Dec. 21	Columbia, Tenn.....	Do.
Higdon, Nick C.....	Pvt., B.	Sept. 19	Hazelhurst, Miss.....	Do.
Hunamer, Leigh W.....	Corpl., K.	July 28	Camp Thomas, Ga.....	Do.
Humes, J. E., jr.....	Pvt., I.	Aug. 22	Meridian, Miss.....	Do.
McGilvray, Alex E.....	Pvt., H.	Aug. 21	Camp Thomas, Ga.....	Do.
Marshall, H. C.....	2d lt., F.	Dec. 15	Columbia, Tenn.....	Do.
Partin, Thomas J.....	Pvt., K.	Aug. 25	Sternberg Hospital, Chickamauga, Ga.....	Do.
Ray, John E.....	Pvt., I.	Sept. 10	Enterprise, Miss.....	Do.
Reid, William M.....	Pvt., A.	July 3	Chickamauga, Ga.....	Do.
Ridgeway, E. A.....	Pvt., L.	July 26	Fort McPherson, Ga.....	Do.
Satchen, Norman.....	Pvt., K.	Aug. 13	Quitman, Miss.....	Measles.
Shields, Thomas C.....	2d lt., C.	Oct. 27	Burhurst, Miss.....	Yellow fever.
Smith, James S.....	Pvt., A.	Aug. 4	Camp Thomas, Ga.....	Typhoid.
Torry, William A.....	Pvt., L.	Aug. 23	Cootspa, Ala.....	Do.
Trenninel, Emile.....	Pvt., D.	Aug. 25	Chickamauga, Ga.....	Do.
Waits, Samuel B.....	Pvt., G.	Aug. 31	Chattanooga, Tenn.....	Do.
Walker, Ben M., Jr.....	Pvt., G.	Aug. 6	.....	Do.
Walker, Ellis E.....	Pvt., L.	Sept. 3	Sternberg Hospital, Camp Thomas, Ga.....	Do.
Wallace, Henry C.....	Pvt., M.	Sept. 10	Lauderdale, Miss., Springs.	(Typhoid); heart failure.
Wallis, Alain V.....	Pvt., L.	June 27	Camp Thomas, Ga.....	Typhoid.
Weckerman, Thos. P.....	Pvt., B.	Aug. —	Chickamauga, Ga.....	Do.

Total deaths..... 33
Deaths due to typhoid fever..... 29

Percentage of deaths among probable cases of typhoid fever (397), 7.30.

Percentage of deaths among recognized cases of typhoid fever (98), 29.59.

It was a common opinion among medical officers at Chickamauga that this regiment brought the typhoid infection to the park, and that it spread from this to other commands. It is undoubtedly true that the First Mississippi reached Chickamauga Park quite widely infected with typhoid fever, but it is not true that this is the only regiment that reached this national encampment in this condition. As we have already seen the majority of the regiments of the First and Third Army Corps reached Chickamauga Park already infected with typhoid fever. The surgeon in charge of the First Mississippi recognized his earlier cases and diagnosed them properly, and for this reason this regiment acquired a bad reputation, which undoubtedly it deserved, but not more so than a large majority of the other regiments. We mean by a bad reputation simply that it reached the park widely infected with typhoid fever.

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST MISSISSIPPI VOLUNTEER INFANTRY.

Medical officers.

Robert L. Turner, major and surgeon, Meridian, Miss.

Henry L. Beamer, captain and assistant surgeon, McComb City, Miss.

Frances M. Shepperd, lieutenant and assistant surgeon, Waynesboro, Miss.

Under date of July 19, 1899, Major Turner gives us the following information:

In my report for May I should have stated that we left two patients in Jackson, both quite sick with what I believed was typhoid fever. We carried at least two developed cases of typhoid

fever to Chickamauga, and I believe that we carried a large number of infected men. Our camp at Jackson was badly crowded in an old field, with very little shade, and we had bad water to drink. I think that the general water supply at Chickamauga was contaminated through Cave Spring Branch. I also think that many of our men were infected by flies from sinks, which were not more than 30 feet from our regimental hospital tents. These sinks were not moved until I made an appeal through higher authority and not until they were filled with myriads of flies and maggots. As soon as the Second Division Hospital of the Third Army Corps was organized, I was detailed to take charge of it and remained there until June 29, when I was stricken with typhoid fever myself. After being in bed more than three months my regiment was furloughed, and I was unable to attend to my duties afterwards. Therefore I know very little about the sick reports of the First Mississippi. I know that B. M. Herrington, whose name appears in the list of deaths, died from cerebro-spinal meningitis and not typhoid fever. I think that Lieutenant Marshall died of yellow fever.

Captain Beamer speaks of the camp sites at Chickamauga as follows:

Our camp was situated just below the Third Tennessee and to the rear of the Fifty-second Iowa. All the filth from the Third Tennessee washed down into our camp, and it was impossible to keep it in good condition. At first we obtained our drinking water from a spring about three-quarters of a mile from camp. Later our camp was moved nearer to this spring. This site was all right until it rained, when it was found that we were located in a swamp. The ground became very muddy; and as there were no floors in the tents, the men were compelled to sleep on the wet ground. Finally we moved out onto a hill into the open air, and at this place we had a nice camp. The flies were very numerous. I think that the spring from which we obtained our water was contaminated.

GENERAL REMARKS CONCERNING TYPHOID FEVER IN THE SECOND DIVISION OF THE THIRD ARMY CORPS.

When we reached Chickamauga Park on our round of inspection (September 10, 1898) all the regiments of this division, with the exception of the Second Kentucky and the Ninth New York, had already departed from the park. We have already given a statement of the condition in which we found the two remaining regiments. For the following information concerning the division as a whole we are indebted to the testimony of Maj. James M. Jenne, chief surgeon of this division. Major Jenne reached Chickamauga Park June 11 and acted as medical inspector until July 16, when he was made chief surgeon of the division. All the regiments were on the ground when Major Jenne arrived. The First Arkansas was located on very low ground, while directly above this regiment were the Ninth New York and the Second Kentucky. The First Arkansas was partially protected from the drainage of the other regiments by a shoulder of the hill that projected behind the officers' quarters. The Second Brigade was situated on the same level, but farther south, with an intervening creek which flowed only after rains. Overlapping the Second Brigade and extending beyond one of its flanks onto higher ground was the First Maine. The Fifty-second Iowa was still farther south and situated

upon a rocky shoulder of ground quite elevated in some portions and wholly denuded of soil. In this regiment the tents were pitched upon the rocks, and the guy ropes were held in position by piles of rock. The Mississippi regiment was somewhat farther south and upon quite low ground in dense shade. A little stream coming from the heights above passed through this camp. This stream originated in the Second Brigade. It was only about 60 paces from the kitchens of the Fifty-second Iowa and the nearest line officer's tent of the Third Tennessee, which belonged to the Third Brigade of the First Division of the Third Army Corps. South of the Mississippi regiment was the Alexandria road, and on the west of this a small stream and an open field. On account of the location the sinks of the Mississippi regiment could not be placed over 30 paces from their company kitchens and about the same distance from other regiments. Major Jenne stated that he remembered going to the camp of the First Mississippi and pacing the ground from the kitchen to the sink, which he found to be 30 paces, and the same distance from the sinks of the Mississippi regiment to the line officers' tents of the Third Tennessee. In locating the sinks of the First Mississippi it was impossible to go farther south or west on account of the little stream which rapidly filled after rains, overflowed its banks, and flooded the woods for some distance. If the sinks had been dug to the west, in the open field, they would have been submerged at times when the stream overflowed. It seemed necessary to locate the sinks where they were placed. It will be seen from this that these regiments were quite crowded, that they were all located in the woods, and that the drainage from some of them passed through the sites of others. The First Arkansas received more or less of the drainage from the Ninth New York and the Second Kentucky. The Ninth New York received, in part at least, the drainage of the Second Kentucky.

When Major Jenne reached Chickamauga all of the regiments were using Chickamauga Creek water, distributed through the commands by means of pipes. Later, this water becoming suspicious, some of these regiments began to draw water from springs, especially from Blue Spring and Crawfish Spring. Water distributed through the pipes was turbid and warm, inasmuch as the pipes were above the ground. Attempts were made, especially in the First Maine and the Fifty-second Iowa, to boil all the drinking water, but according to Major Jenne the supply of boiled water was at no time sufficient, and the men daily took water from other sources. There was only one driven well near the regiments of this division, and Major Jenne is of the opinion that the water from this was not at all times used. After the medical officers became suspicious of the Chickamauga Creek water, and attempted to substitute spring water for it, there was a general shortage of drinking water on account of there being an insuffi-

cient number of barrels in which it could be transported. On account of this insufficient supply of water from the springs men continued to drink more or less of the piped water, and doubtless drank at times from wet-weather springs.

An attempt was made to filter the water for the entire division. Each regiment was furnished with eleven pairs of Maignem and Berkefeld filters. In the First Brigade these filters were brought together at one place and an attempt was made to filter enough drinking water for the whole brigade. This attempt to filter the water did not prove successful. The Maignem filters soon became obstructed and many of the Berkefeld filters were broken. The filtering plant for the First Brigade was in charge of a detail from the Ninth New York, and within a few days so many filters were disabled or broken that the attempt was given up and pronounced a failure. In the Second and Third brigades each regiment attempted to filter its own water, but in these also the same result was reached—the filters became clogged, many were broken, and the attempt was discontinued. At this place we wish to state that in our opinion for troops in the field all attempts made to filter the water by means of the Maignem and Berkefeld filters were failures. We do not consider these filters at all adapted to this purpose. In permanent garrisons where the filters can be attached to hydrants they are undoubtedly of service, but in the field, where it frequently happens that water containing suspended matter must be filtered, these filters, together or singly, have not been a success and will not be a success. The national encampments at Chickamauga and Camp Meade were strewn with broken filters, which represented a large and useless expenditure.

Major Jenne stated that throughout this division there were numerous wet-weather springs from which the men frequently drank. It is more than likely that these springs account very largely for the large number of cases and the excessive mortality from typhoid fever in this division. As has been already stated, some of the regiments were located upon rocky knolls. The rains falling upon these sites washed infected matter under the rocks, carried it some distance under the surface of the ground, and broke out lower down the hillside, often within other regimental encampments, as wet-weather springs, from which the men drank to a greater or less extent.

When asked his opinion concerning the origin and spread of typhoid fever in this division, Major Jenne made the following statement:

My belief is that the Mississippi regiment came to the park infected with typhoid fever. From the sinks of this regiment the creek that flowed near by became contaminated. This creek empties into Chickamauga Creek only a few feet below the intake of the general water supply distributed to the regiments. I believe that in this way the general water supply became contaminated and typhoid fever was spread throughout the division.

When asked if he believed that the disease was spread by means of flies, he replied as follows:

Yes; I have no doubt that this was one of the most fruitful means of the spread of the disease. The sinks in some of the regiments of this division, certainly during the wet season, were almost constantly filled with water. A great deal has been stated about the sinks not being properly ditched. This was true in some instances, but had all the sinks been properly ditched they would still have filled with water from the bottom and the sides. When a sink was dug soon after a shower the water would flow into it like a spring. I have seen this time and time again; I have seen men digging sinks and the water flowing in from the sides and bottoms while they were digging. Water did not soak into all the sinks. In digging one on the side of a hill it would be likely to fill with water, while another dug on the level might remain dry. There were some sinks that gave me a great deal of trouble. I used a solution of bichloride of mercury and plenty of lime in them. When they were nearly full of water and fecal matter I put cord wood across them and placed straw and brush on the wood and heaped earth over them. If an attempt had been made to fill these sinks in the ordinary way the earth thrown in would have caused the contents to overflow. Indeed, it is quite out of the question to throw earth into these sinks, because it displaces the water. It was the practice to put straw in them from the corrals and burn them. Some of the sinks were situated on sharp inclines, and during rains they would fill, overflow, and run down the hillsides, sometimes through the camp. There were three regiments situated one after the other passing down the hill, so that whatever wash there was from their sinks and the regiment above came to them. These were the First Mississippi, the Fifty-second Iowa, and the First Maine. Of these three regiments the Fifty-second Iowa occupied the highest ground, and the flow from this site was in one direction toward the First Maine and in the other direction toward the First Mississippi. The Third Tennessee was farther up the hill. All of these regiments were closely crowded together.

In regard to the hospital of this division, Maj. Woodhull, in his report already referred to, makes the following statement:

Nearly, if not all, of the regiments in this division maintained regimental hospitals. For instance, the Ninth New York has from 6 to 8 men in a local hospital out of 60 supposed to be in quarters. In the division hospital are 33. The regiment has had about 30 cases of typhoid, but the proportion of malarial cases is now large. First Arkansas has 37 in hospital and 85 in quarters. When examined there was a small regimental hospital, maintained by individual subscription, in which were 3 cases of dysentery alleged to have been returned from the division hospital. First Maine has 7 men in the regimental hospital. Of the 42 officers, 7, or 16.67 per cent are sick—all with typhoid fever.

The hospital of this division (Major Bradbury, First Maine, in charge) consists of 37 hospital, 8 conical, and 6 common tents, containing 285 cots and 250 patients. Eight medical officers are present for duty, with 6 stewards and 138 privates. Of the latter, 45 were men of the line detailed from regiments. To this date (August 7, 1898) 1,190 patients have passed through the hospital, and 56 typhoid cases were present. Were all the men in the division who should be in hospital present it would be overcrowded, as it has been when men were at times literally upon the ground, and at other times medical officers have given up their own accommodations to them. Sometimes typhoid patients are returned to their regiments for convalescence in order to make room. Speaking generally, the condition of the hospital is very good. The streets are broad and well policed; the general police is excellent; the ordinary wards are very good, but the typhoid ward is too crowded, and formerly was still more so, when the cots touched each other.

There is great difficulty in disinfecting the bedding. The hospital is brigaded, but not the attendants, and there would be difficulty were the command suddenly broken up. There are several brigade surgeons at this hospital and it is plain that they do not regard that as their proper sphere. The records are well kept, but great difficulty is experienced in obtaining supplies. This seems to be partly technical and partly from insufficient stores. I examined the record of a requisition made on the 1st, acted on on the 13th, 17th, and 19th, and on the 22d filled in part. I saw another where 2 articles were supplied out of 17 authorized. The hospital finds it practically impossible to get intestinal antiseptics, such as salol or strychnia or subgallate of bismuth. It is very largely dependent upon regimental and Red Cross funds, and a case of boxes to hold regimental supplies has been arranged to stimulate regimental interest, which is quite foreign to the principle of these organizations. The Red Cross supplies 1,500 pounds of ice daily, milk, food, comforts, and some absolute necessities, as medicine, themselves.

The following figures give the most important facts concerning typhoid fever in this division:

Brigade and regiment.	Date of first case.	Total number of cases.	Number of recognized cases.	Total deaths.	Deaths from typhoid.	Per cent of deaths among probable cases.	Per cent of deaths among recognized cases.
<i>First Brigade.</i>							
Second Kentucky.....	June 26	286	87	30	28	9.79	32.18
Ninth New York.....	June 10	323	139	46	46	14.24	33.09
First Arkansas.....	June 2	228	83	23	19	8.33	22.89
<i>Second Brigade.</i>							
Fifth Missouri.....	June 6	212	51	16	14	6.60	27.45
Second Arkansas.....	June 4	287	95	26	17	5.92	17.89
Sixty-ninth New York	June 12	299	191	25	23	7.69	12.04
<i>Third Brigade.</i>							
First Maine.....	June 25	188	88	45	45	23.93	51.13
Fifty-second Iowa.....	June 8	345	184	37	36	10.43	19.56
First Mississippi.....	June 1	397	98	33	29	7.30	29.59

Total number of cases of probable typhoid fever in the nine regiments of this division.....	2,565
Total number of deaths from typhoid fever in the nine regiments of this division.....	257
Percentage of deaths among probable cases of typhoid fever.....	10.02
Total number of cases of recognized typhoid fever in the nine regiments of this division.....	1,016
Percentage of deaths among recognized cases of typhoid fever.....	25.29

Summary of deaths in the Second Division of the Third Army Corps.

Brigade and regiment.	Total deaths.	Deaths due to typhoid fever.
<i>First Brigade.</i>		
Second Kentucky.....	30	28
Ninth New York.....	46	46
First Arkansas.....	23	19
Total.....	99	93
<i>Second Brigade.</i>		
Fifth Missouri.....	16	14
Second Arkansas.....	26	17
Sixty-ninth New York.....	25	23
Total.....	67	54
<i>Third Brigade.</i>		
First Maine.....	45	45
Fifty-second Iowa.....	37	36
First Mississippi.....	33	29
Total.....	115	110
Total deaths.....	281	
Deaths due to typhoid fever.....	257	
Percentage of deaths from typhoid fever to total deaths.....	91.45	

GENERAL REMARKS CONCERNING TYPHOID FEVER IN THE THIRD ARMY CORPS.

Colonel Hoff, chief surgeon of this corps, has furnished us with considerable valuable information concerning sickness in it. Colonel Hoff reported for duty at Chickamauga Park May 25, 1898, and remained with this corps during its stay there. When asked to give his opinion concerning the introduction of typhoid fever in this corps, Colonel Hoff responded as follows:

Typhoid fever was brought in in the very beginning with the troops. I speak now particularly of the Third Corps, with the history of which I am familiar from the date of its organization. Three regiments joined the Second Division of the Third Corps about the latter part of May or early in June, and these regiments came on the ground with what was practically a disabling sick list. These three regiments were the First Mississippi and the First and Second Arkansas. The record of the First Mississippi begins on the 12th of June and total of sick reported for that day was 64. This number did not include all of those actually sick. There was a large number in the regiment who were sick, but who were not reported at that time. You will see [referring to a chart showing the curve of sickness in this regiment] as we go on we come to a very remarkable upshoot on the 30th day of June. This remarkable upshoot is due to the fact that that regiment was vaccinated at this time. There were one hundred or more men suffering from the effects of vaccination, so this upward move of the curve must be regarded as only an incident. It will be seen that this upward turn reached its maximum on July 2. After this there was a gradual subsidence until the sick report went down to about what it was in the beginning, showing 85 men on the sick report on the 7th day of July. From the latter date on the sick list increased, as you see, with considerable rapidity, reaching the maximum on August 20, on which date the total on sick call numbered 210. From August 20 to September 9, when the First Mississippi left for Lauderdale, the sick curve declines. This is in part due to the fact that men were sent home on sick furlough and were not carried on the sick report. It does not necessarily indicate diminished sickness. The Arkansas regiments came into this camp in practically the same condition as did the Mississippi regiment.

It should be understood that in the above statement Colonel Hoff was speaking of total sickness and not of typhoid fever especially. He convinced us that these three regiments came to Chickamauga with a high sick list and continued in this condition throughout their stay.

It will be seen by reference to the tables already given that of the regiments of the Second Division of this corps (excluding the Sixty-ninth New York, which remained at Chickamauga Park for only a few days) all except the Second Kentucky and the First Maine reached Chickamauga Park infected with typhoid fever; while of those of the First Division (excluding the Fifth Maryland, which remained at Chickamauga Park for only a few days) all reached the park infected with typhoid fever with the exception of the Eighth New York.

Continuing his testimony, Colonel Hoff stated:

The Fifty-second Iowa and the First Maine reached the park in excellent condition. Going over the First Division, the Second Nebraska, Second Missouri, and Fourteenth New York came in excellent shape. The Eighth New York had a doubtful record so

far as is indicated by total sickness from the very beginning. Typhoid fever gradually spread from the infected regiments and soon there were cases in every regiment of the corps. By the middle of July, or earlier, all regiments were reporting a few cases of typhoid fever, but it could be called epidemic only in the three regiments mentioned (First Mississippi, First and Second Arkansas). In most of the regiments at that time typhoid fever was scarcely recognized, most of the cases being designated as "malaria." Up to the middle of August, possibly later, I believe that the infection was spread by means of flies. I believe the water supply became infected about the latter part of July, and from that time on there was a decided rise until it culminated, about August 20.

Colonel Hoff believed that the general water supply taken from Chickamauga Creek became contaminated by the drainage from the camps, but that water contamination was not confined to this source.

He stated:

I thought that every spring and every well, or almost all, in the park must have partaken of the infection. This is only an opinion, but the fact that we had an extraordinary and widespread morbidity leads to the inference that there must have been some common cause.

When asked about the first case of typhoid fever, Colonel Hoff stated:

The first case of typhoid fever that was diagnosticated appeared in the Second Division Hospital about June 15. It appeared about the time when the cases began to be carefully investigated. The hospital opened about June 10, but it was not in running order until about June 15, and I have no doubt that had a careful investigation been made earlier cases of typhoid fever would have been recognized before the time given. It is difficult for anyone who has not been through it to understand what a Herculean task it was to introduce even the simplest form of reports among these organizations. We asked the regimental officers to report to us every day the number of people excused from duty, and we insisted upon this report. After receiving it, I frequently sent an inspector around to find out how the consolidated report agreed with the regimental reports, and I would often find a difference of 50 or 60 between the reports. These inaccuracies were not confined to the medical department. It frequently happened that the consolidated monthly report showed a loss of more than 1,000 men. We kept no specific account of typhoid fever. We had a general record of the morbidity without reference to any one disease. There were many cases of measles and mumps, and a good many cases of fever diagnosticated as "malarial fever." A few of the cases were diagnosticated as "typhoid fever," but the latter were in proportion to the whole comparatively rare.

When asked if he could approximate the date on which he believed the general water supply became infected, Colonel Hoff stated:

I should say about July 20, judging from the rapid advance of the disease from that time. I do not mean to say that the number of cases began to increase immediately after July 20, but that the increase was more marked two or three weeks after this date, and this is the reason why I believe that there must have been some infection about that time from some source that was capable of producing a general infection. The water supply was the only thing the regiments were using in common. The advance of the disease, so far as the First Division of the Third Army Corps is con-

cerned, was exceedingly slow. This division always had a lower curve than the Second Division, but the two curves went up simultaneously.

Colonel Hoff was of the opinion that the Second Division suffered more heavily than the First on account of the presence in the Second Division of the three highly infected regiments. He also believed that the infection spread from the Second Division through the First, notably through the Third Brigade of the First Division, which was encamped very near the Third Brigade of the Second Division.

The following figures show the relative prevalence of typhoid fever and the mortality from this disease in the two divisions of the Third Army Corps:

Total number of cases of probable typhoid fever in eight regiments of the First Division	1,853
(It will be seen that this includes the Second New York which remained at Chickamauga only twelve days.)	
Total number of cases of probable typhoid fever in the nine regiments of the Second Division	2,565
Total number of deaths from typhoid fever in eight regiments of the First Division	160
Total number of deaths from typhoid fever in the nine regiments of the Second Division	257
Percentage of deaths among probable cases of typhoid fever in eight regiments of the First Division	8.63
Percentage of deaths among probable cases of typhoid fever in the nine regiments of the Second Division	10.02
Total number of cases of recognized typhoid fever in eight regiments of the First Division	725
Total number of cases of recognized typhoid fever in the nine regiments of the Second Division	1,016
Percentage of deaths among recognized cases of typhoid fever in eight regiments of the First Division	22.07
Percentage of deaths among recognized cases of typhoid fever in the nine regiments of the Second Division	25.29
Aggregate strength of the eight regiments in the First Division	9,444
Aggregate strength of the nine regiments in the Second Division	11,124
Percentage of cases of probable typhoid fever in eight regiments of the First Division	19.62
Percentage of cases of probable typhoid fever in the nine regiments of the Second Division	23.06

It will be seen from these figures that typhoid fever was both absolutely and relatively more prevalent in the Second Division than in the First Division of this corps.

Aggregate strength of the seventeen regiments of this corps.	20,568
Total number of cases of probable typhoid fever in the seventeen regiments of this corps	4,418
Percentage of cases of probable typhoid fever in the seventeen regiments of this corps	21.47
Total number of deaths from typhoid fever in the seventeen regiments of this corps	417
Percentage of deaths among probable cases of typhoid fever in the seventeen regiments of this corps	9.43

The table following will show the morbidity and mortality from typhoid fever in the Third Army Corps.

Table showing for certain regiments of the Third Army Corps at Chickamauga the mortality and morbidity from typhoid fever.

Regiments.	Mean strength.	Cases of typhoid fever.		Deaths from typhoid fever.	Deaths from all diseases.	Deaths from typhoid fever in 100 cases of—		Percentage of deaths from typhoid to deaths from all diseases.	Morbidity of typhoid fever in 1,000 mean strength.		Deaths from typhoid fever in 1,000 of mean strength.
		Certain.	Certain and probable.			Certain typhoid.	Certain and probable.		For certain cases of typhoid.	For certain and probable cases of typhoid.	
First Division, Third Corps.											
Fourteenth New York	1,277	95	233	24	31	25.26	10.30	77.41	74.39	182.45	18.79
First Missouri	1,275	46	216	11	14	23.91	5.09	78.57	36.07	169.41	8.62
Fifth Maryland	985	147	250	17	18	11.56	6.80	94.44	149.23	253.80	17.25
Second Nebraska	1,303	56	167	22	26	39.28	13.17	84.61	42.97	128.16	16.88
Second New York	1,014	46	161	30	31	65.21	18.63	96.77	45.36	158.77	29.58
Third Tennessee	1,293	61	123	12	19	19.67	9.75	63.15	47.17	95.12	9.28
First Vermont	996	84	278	22	26	26.19	7.91	84.61	84.33	279.11	22.08
Eighth New York	1,301	190	425	22	23	11.58	5.17	95.65	146.04	326.67	16.91
Total	9,444	725	1,853	160	188	22.06	8.63	85.10	76.76	196.20	16.94
Second Division, Third Corps.											
Second Kentucky	1,332	87	286	28	30	32.18	9.79	93.33	65.31	214.71	21.02
Ninth New York	1,292	139	323	46	46	33.09	14.24	100.00	107.58	250.00	35.60
First Arkansas	1,290	83	228	19	23	22.89	8.33	82.60	64.34	176.74	14.72
Fifth Missouri	1,274	51	212	14	16	27.45	6.60	87.50	40.03	166.40	10.99
Second Arkansas	1,291	95	287	17	26	17.89	5.92	65.39	73.58	222.30	13.16
Sixty-ninth New York	1,026	191	299	23	25	12.04	7.69	92.00	186.15	291.42	22.41
First Maine	1,286	88	188	45	45	51.13	23.93	100.00	68.42	146.19	34.99
Fifty-second Iowa	1,304	184	345	36	37	19.56	10.43	97.29	141.10	264.57	27.60
First Mississippi	1,029	98	397	29	33	29.59	7.30	87.87	95.23	385.81	28.18
Total	11,124	1,016	2,565	257	281	25.29	10.01	91.45	91.33	230.58	23.10
Total Third Army Corps	20,568	1,741	4,418	417	469	23.95	9.43	88.91	84.64	214.79	20.27

CHAPTER VI.

TYPHOID FEVER IN OTHER ORGANIZATIONS AT CHICKAMAUGA.

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Besides the regiments already given as constituting the First and Third Army Corps, certain other organizations attached to one of these corps, but not an integral part of it, were stationed for awhile at Chickamauga. A brief statement of the prevalence of typhoid fever among these organizations may be of interest.

TYPHOID FEVER IN THE CAVALRY BRIGADE OF THE FIRST ARMY CORPS.

CAVALRY BRIGADE OF THE FIRST ARMY CORPS.

Regiment.	Arrived at Chick- amauga.	Strength on arrival.	Left Chicka- mauga.	Strength on leaving.	No. of cases devel- oped at Chicka- mauga.	No. of cases devel- oped after leaving Chicka- mauga.
Third United States Volunteer Cavalry ..	May 30	1,004	Sept. 10	1,013	270	0
First Illinois Volun- teer Cavalry	June 1	1,255	Aug. 25	1,299	159	61
First Ohio Volunteer Cavalry	May 15	830	July 13	833	9	180

THIRD UNITED STATES VOLUNTEER CAVALRY.

First Cavalry Brigade, First Army Corps.

This regiment was recruited chiefly in Montana, Idaho, and the Dakotas. It arrived at Chickamauga Park in detachments, as follows: Troops B, E, and K, May 23; Troops A, C, and D, May 27; Troops I and M, May 28; Troops G and H, May 29; Troops F and L, May 30.

The medical officer at this time, Roy A. Wilson, first assistant surgeon, did not arrive until the last of the month. Consequently there is no report for May.

The June report is signed by Maj. Henry G. Fish, who states:

Measles have been prevalent, but are decreasing.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,004
Intermittent fever	2
Malaria	1
Diarrhea	139
Colitis	4
Dysentery	1
General debility	2
Intestinal intoxication	1
Intestinal disturbance and fever	1
Intestinal fever	4
Constipation and fever	1
Other diseases	94
Total	250

In the July report Roy A. Wilson, assistant surgeon, states:

The prevailing diseases are typhoid fever and malaria; both are on the increase.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,015
Dysentery	3
Intestinal disturbance	1
Intestinal fever	1
Intestinal intoxication	1
Diarrhea	174
Typhoid fever	11
Remittent malaria	27
Malaria	46
Intermittent malaria	3
Other diseases	161
Total	428

The August report is signed by Asst. Surg. Roy A. Wilson, without comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,015
Typhoid fever.....	71
Malaria.....	226
Diarrhea.....	284
Gastritis.....	5
Enteritis.....	1
Indigestion.....	5
Other diseases.....	127
Total.....	719

The September report covers only the first three days of that month.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,015
Malaria.....	14
Gastritis.....	1
Typhoid fever.....	3
Diarrhea.....	58
Other diseases.....	15
Total.....	91

The study of this regiment is of special interest for two reasons. In the first place, it is one of the few regiments which there is reason to believe reached Chickamauga Park without bringing with it one or more persons already infected with typhoid fever. We say that this is probably the case. As has been stated, the different troops arrived during the last few days of May. The first probable case of typhoid fever occurred June 15. This man belonged to Troop E, which reached Chickamauga May 23. It is possible that this individual may have been a recruit and may have reached the park later, but there is no evidence that this was the case. We will therefore presume that this man came with his troop to Chickamauga May 23. Twenty-three days later he responded to sick call. His disease was first diagnosed diarrhea; subsequently it was changed to malaria. Apparently he remained sick in quarters from June 15 until July 26. On the last-mentioned date he was returned to duty, but five days later he was found to be sick again, and the record leaves the case incomplete; it only shows that he was still sick August 13. With this history it is almost certain that this was a case of typhoid fever and that the man became infected after reaching Chickamauga. The second point of interest attached to this regiment lies in the fact that the two camp sites occupied by it while at Chickamauga both became notoriously filthy. Our board inspected this regiment on its last camp site and can testify to the fact that not only were the sinks in a disgusting condition, but the woods around the sinks were so filled with fecal matter that it was almost impossible to walk through them without soiling the feet.

As has been stated, the first probable case of typhoid fever had its initial date June 15. There were 2 cases June 20, 1 June 21, 1 June 22, 2 June 23, and 1 June 25, making 8 cases in all for the month of June. For July there were 96 cases, and in August 156. During the first few days of September, when the regiment was preparing to move, there were 9 cases. In addition to these there is one case for which no date is given, making in all 270 cases of probable typhoid fever in this regiment up to the 8th of September. It is true that this number is not so large as that furnished by certain other regiments, but we regard this regiment as furnishing a valuable history for the reasons already given.

SUMMARY.

Assembled at points in Montana, Idaho, and the Dakotas in April and May, 1898.

Mustered into United States service from May 10 to 20, 1898.

Arrived at Chickamauga Park, Ga., in detachments, from May 23 to 30, 1898.

Strength on arrival, 1,004.

Date of first case of probable typhoid fever, June 15, 1898.

Date of first case of recognized typhoid fever, June 23, 1898.

Left Chickamauga Park September 10, 1898.

Strength on departure, 1,013.

Number of cases of probable typhoid fever developed at Chickamauga..... 270

Disbanded after leaving Chickamauga.

Number of cases of probable typhoid fever reported after disbanding..... 0

Total number of cases of probable typhoid fever developed in the Third United States Volunteer Cavalry from May to September, 1898..... 270

These 270 cases were diagnosed as follows:

Typhoid fever.....	103
Malaria.....	119
Diarrhea.....	47
Dysentery.....	1
Total.....	270

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bahler, Christian.....	Pvt., D.	1898. July 11	Camp Thomas, Ga....	Cerebro-spinal meningitis.
Beech, Algernon J.....	Pvt., B.	Sept. 21	Champion, Mich.....	Typhoid.
Connors, Charles S.....	Pvt., L.	July 25	.....	Do.
Eagan, Patrick.....	Pvt., M.	Aug. 24	Chickamauga, Ga.....	Do.
Foster, Herbert B.....	Pvt., I.	Aug. 18	.....	Do.
Fraser, Isaac.....	Pvt., I.	Sept. 10	Chickamauga, Ga.....	Do.
Johns, Edmund.....	Pvt., F.	Aug. 24	Leiter Hospital, Ga....	Do.
Langley, Clarence S.....	Pvt., L.	Aug. 26	Camp Thomas, Ga.....	Do.
Lawrence, Herbert F.....	Pvt., E.	June 14	Leiter Hospital, Ga....	Pneumonia.
MacLaren, George A.....	Pvt., A.	Sept. 5	Camp Thomas, Ga.....	Typhoid.
McNichols, Claude D.....	Pvt., K.	Aug. 26	.....do.....	Do.
May, Charles J.....	Pvt., I.	Aug. 9	.....	Do.
Powell, Willis M.....	Pvt., K.	Aug. 6	Chickamauga, Ga.....	Do.
Sweet, William.....	Pvt., L.	Sept. 10	.....do.....	Do.
Williams, W. R.....	Pvt., A.	Oct. 20	.....do.....	Do.

Total deaths..... 15

Deaths due to typhoid fever..... 13

Percentage of deaths among probable cases (270) of typhoid fever, 4.81.

Percentage of deaths among recognized cases (103) of typhoid fever, 12.62.

FIRST ILLINOIS VOLUNTEER CAVALRY.

The first report from this regiment covers the period from May 21 to May 31, inclusive. Major Culbertson, in charge, makes the following statement:

The First Illinois Volunteer Cavalry was mustered into service May 21, 1898, at Springfield, Ill. The command, consisting of headquarters and twelve troops, officers and men, left Camp Tanner May 30 and arrived at Camp George H. Thomas June 1. During the stay of the regiment at Camp Tanner, owing to the inclement state of the weather, a number of cases of pneumonia and meningitis presented themselves. Three cases were left at St. John's Hospital, Springfield, Ill., in charge of Lieutenant Bellau of the Twelfth Infantry and Dr. G. M. Kreider of the Illinois National Guard.

This report includes fourteen cases, none of which could possibly be typhoid fever. There are two cases diagnosed as intestinal toxemia; one of these was off duty two days and the other for one day. The mean strength is given in this regiment as 1,027.

The June report is signed by Acting Assistant Surgeon Robeson, who makes the following statement:

Most of the sickness has been due to diarrhea and dysentery. One case of typhoid fever was taken to Leiter Hospital. One case of appendicitis was operated upon by Dr. Nicholas Senn and died on the third day after the operation. There is no malaria or infectious disease present.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,255
Acute diarrhea	112
Intestinal toxemia	18
Malarial fever	1
Typhoid fever	1
Other diseases	157
Total	289

We are again called upon to observe that there is a contradiction between the statement of the surgeon and the details of his report. As has been seen, he states that there is no malaria or any other infectious disease present, while his report gives one case of malaria and one case of typhoid fever.

It is an interesting fact that during the first ten days of this month the cases of diarrhea and intestinal toxemia were of very short duration, none of them lasting more than three days. On June 10 there occurs a case of intestinal toxemia which continued for eleven days; on June 11 a case of diarrhea which continued for eleven days, and another of the same disease which continued for thirteen days. After this there are several cases of diarrhea of from six to ten days in duration. The case of recognized typhoid fever occurred on June 20. It was first diagnosed as "chills and fever." The patient was a private of Troop G. This man was transferred to Leiter Hospital June 28 and died on the same day.

The July report is signed by Major Robeson, with the following statement:

The prevailing diseases in camp are diarrhea, typhoid fever, and malaria. The malaria is mostly of the remittent type. The diarrheas are decreasing, the typhoid fever is increasing. The cause is not known.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,241
Intermittent malaria	2
Remittent malaria	3
Acute diarrhea	104
Intestinal toxemia	22
Typhoid fever	11
Other diseases	145
Total	287

The August report is signed by Major Robeson, with the following statement:

The regiment was at Camp George H. Thomas, Chickamauga Park, Ga., until August 25, when it departed for Fort Sheridan, Ill., arriving August 27. The hospital train left Camp Thomas August 25, reaching Fort Sheridan at 2 a. m., August 26, with 132 patients, 20 attendants, a surgeon, and an assistant surgeon.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength not given.	
Intermittent malaria	20
Remittent malaria	126
Acute diarrhea	89
Intestinal toxemia	1
Typhoid fever	52
Undetermined fever	38
Other diseases	91
Total	417

This regiment was furloughed by special order September 5. The difficulty of obtaining accurate information from sick reports is well illustrated by the records of this regiment. In the August report every case of remittent fever is marked "quartan," while the intermittent malarias are marked "tertian." In the September report this nomenclature is reversed, the remittent malarias are marked "tertian" and the intermittent "quartan." Most of the cases of typhoid fever found in the September report have been brought over from previous reports. There are no comments by the surgeon upon the September report.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,209
Intermittent malaria	106
Remittent malaria	35
Acute diarrhea	10
Typhoid fever	33
Dysentery	1
Other diseases	30
Total	215

We have tabulated 220 cases of probable typhoid fever in this regiment. These are distributed through the months as follows:

June	2
July	37
August	159
September	22
Total	220

SUMMARY.

Assembled at Camp Tanner, Springfield, Ill., in April and May, 1898.

Mustered into United States service May 21, 1898.

Arrived at Chickamauga Park, Ga., June 1, 1898.

Strength on arrival, 1,255.

Date of first case of probable typhoid fever, June 10, 1898.

Date of first case of recognized typhoid fever, June 20, 1898.

Left Chickamauga Park, Ga., August 25, 1898.

Strength on departure, 1,299.

Number of cases of probable typhoid fever developed at Chickamauga

159

Went from Chickamauga Park to Fort Sheridan, Ill.

Number of cases of probable typhoid fever developed after leaving Chickamauga Park

61

Total number of cases of probable typhoid fever developed in the First Illinois Volunteer Cavalry from May to September, 1898.

220

These 220 cases were diagnosed as follows:

Typhoid fever.....	68
Malaria	151
Diarrhea.....	1
Total	220

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Auer, Robert C.....	Pvt., C.	Aug. 1	Camp Thomas, Ga....	Typhoid.
Bangs, Frank H.....	Pvt., K.	Aug. 15	Chickamauga, Ga....	Do.
Beam, Frederick.....	Pvt., G.	July 28	Lookout Mountain,	Do.
Buffham, George C....	Pvt., B.	Aug. 21	Tenn.	Do.
Chambers, Joseph L....	Pvt., B.	Aug. 27	Fort Sheridan, Ill....	Do.
Gudlin, C. H.....	Trmp., H	Aug. 4	Camp Thomas, Ga....	Do.
Hill, George S.....	Pvt., A.	July 26	do.....	Do.
Kennedy, Fred E.....	Sgt., H.	Sept. 1	Fort Sheridan, Ill....	Do.
Littell, Edward B.....	Pvt., G.	Aug. 11	Springfield, Ill.....	Appendici-
McLaughlin, John J....	Pvt., E.	Sept. 4	Fort Sheridan, Ill....	Us.
Oden, W. E.....	Pvt., H.	June 26	do.....	Typhoid fe-
Ruben, Eimir R.....	Pvt., A.	Nov. 5	1444 Belmont street,	ver and
			Chicago, Ill.	pneumo-
				nia.
Smith, Ernest L.....	Pvt., E.	Aug. 18	Camp Thomas, Ga....	Do.
Sorenson, Carl.....	Pvt., L.	Sept. 6	Lacon, Ill.....	Do.
Specht, Carl B.....	Pvt., H.	Sept. 24	Valparaiso, Ind.....	Do.
Triplett, Louis H.....	Sgt., H.	July 5	do.....	Do.
Worth, Emil.....	Pvt., F.	Aug. 20	Camp Thomas, Ga....	Do.

Total deaths..... 17

Deaths due to typhoid fever..... 16

Percentage of deaths among probable cases (220) of typhoid fever, 7.27.

Percentage of deaths among recognized cases (68) of typhoid fever, 23.53.

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST ILLINOIS VOLUNTEER CAVALRY.

Medical officers.

Jay Robeson, major and surgeon, Chicago, Ill.

Jesse Rowe, captain and assistant surgeon, Chicago, Ill.

Albert E. Mowry, lieutenant and assistant surgeon, Chicago, Ill.

Captain Rowe states:

The First Illinois Volunteer Cavalry was first encamped on the Illinois State fair grounds at Springfield. About the time of our being mustered into service we occupied what was known as the "Manufacturing building," these quarters having been recently vacated by the Third Infantry. This latter regiment, I understood, had two cases of cerebro-spinal meningitis here, and our regiment developed two cases of the same malady also. Our water supply at Springfield was excellent, and all sewage was carried away through the city sewerage system. We had no cases of typhoid fever here.

We started for Chickamauga May 30. Arriving at our destination, we were first encamped in the timber lands adjoining the Brotherton field. The second day after our regiment was settled, while bathing in Chickamauga Creek, just below the intake pipes of the pumping station, I saw fecal masses floating on the surface of the stream. Our water supply was furnished from this creek, and we were told that the water was well suited for drinking purposes. I do not know who was responsible for the order designating the source of our water supply, but it came from general headquarters. As soon as the true condition of things was discovered our men were ordered to discontinue the use of this creek water, and our supply was hauled from Crawfish Spring and the springs at Rossville. A supply was also obtained from the springs 3 miles east of camp. The first men affected by typhoid admitted having drunk water from the pipes when they were out with the horses and thirsty. The pipe water was always muddy and turbid and had a distinctly bad flavor after we arrived in camp, although I understood it had formerly been very clear, but on account of the recent rains a great deal of foreign matter had been washed into it.

Another source of our drinking water was bored wells. The water from these wells was very clear and of good flavor, but after the rains it was very muddy, full of sand, and at times had a distinct odor. The surface of the ground was very hard and compact, having substratum of rock, which seemed to carry the water in distinct channels direct to the wells. Fecal matter was distributed indiscriminately throughout the timber to the north of the camp and in most places where there were no special guards stationed throughout the grounds. At times it was almost impossible to walk through the timber without coming in contact with these insanitary evidences. It was no unusual thing after a heavy rain for the sinks to be entirely overflowed; and as little streams became raging torrents at these times, this fecal matter was left in masses high and dry along the course of the streams and oftentimes 25 or 50 feet from their bed. I am confident that this fecal matter was carried directly to the source of the water supply of the wells, and the sinks being left open gave free access to the flies, which were very annoying, and, together with the flying particles of dust raised by the horses during drill maneuvers, contributed not a little to the general insanitary condition. Later these sinks were covered with dirt each time after being used.

While riding through the country south of our camp I interviewed a number of farmers and old residents, and learned from them that typhoid fever had been prevalent in the country above our camp drained by the Chickamauga Creek; that they had thrown fecal matter indiscriminately on the ground, in one instance in the barn lot. These things took place in the fall preceding our encampment. Notwithstanding these disgusting practices, we were repeatedly assured that Chickamauga Creek was bacteriologically pure.

I will add that the officers of the headquarters mess received their water supply direct from the McDonald springs, at Rossville, and that there were no cases of typhoid fever among these men, although a large number of cases developed among the attendants at the hospital.

Our regiment afterwards moved into the Brotherton field, an open space adjoining the timber where we were first camped. Here large drainage ditches were dug along the troop streets, and

a considerable number of very mild cases of malaria developed during a period of about two weeks. None of these cases were severe, however, and yielded readily to treatment.

In attempting to locate the source of the typhoid infection at this encampment, I am convinced that Chickamauga Creek was a fertile breeding ground for the disease, the swarms of flies, the impure water of the wells, and the flying particles of dust contributing their not insignificant part to the general deplorable, not to say damnable, condition.

Lieutenant Mowry writes the following:

Our hospital corps was composed of eight graduates in medicine and the rest were advanced medical students from Chicago medical colleges. With this class of men we were enabled to do considerable scientific investigation, especially in the matter of blood examinations. During the first six weeks at Chickamauga we had but few cases of typhoid fever. The camp was carefully policed and all possible means taken to prevent any spread of infection. The tents were taken down once each week and the sun allowed to thoroughly dry all the tent floors. The water supply was watched carefully to avoid any contamination. The troops were required to keep the water barrels clean. The water supply at Chickamauga was watched closely, and the drinking water was, for the most part, hauled from Crawfish Spring, which appeared to be an ideal water supply. Some small quantity of the water was secured at near-by springs, which were apparently good.

The typhoid epidemic in our regiment began soon after Grigsby's Rough Riders changed their camp to a point adjacent to our camp. The sanitary conditions of their regiment were not watched so closely as in ours. From personal observation I believe that the fever epidemic was due much more to flies than to the water. Not enough care was taken to see that the sinks were covered with earth at intervals frequent enough, and although we constantly ordered a large amount of lime to disinfect the sinks there was but little furnished us. For instance, Major Cuthbertson tried very hard to have the medical department allow us 12 barrels of lime at one time. We finally got 1 barrel after repeated futile attempts to secure the desired amount. There was a marked carelessness or indifference on the part of the medical officers in charge of the entire camp in the matter of giving us proper disinfectants for the sinks. The flies were very numerous, beginning about the middle of July, and a piece of bread would be covered with flies and fly deposits if allowed to remain for a minute or two. Where the men's tables were protected by mosquito netting there was little or no typhoid contracted, while mess tables not so protected were fertile sources of infection. The sinks were too close to the camps and were a mass of flies and maggots.

There was but little malaria in our regiment, and doubtful cases in nearly all instances proved to be typhoid when tested by the Widal test. It is my firm conviction that the water supply at Chickamauga was, for the most part, excellent, as most of it came from a spring that seemed to come out of solid rock and which was some distance from any regiment. The sinks should have been at least one-eighth of a mile from the camp, and should have been thoroughly disinfected with lime each day and covered over with dirt at least twice a day. The regiments should have been scattered farther from each other. I do not remember of a single officer in our regiment having contracted typhoid where protection to their mess tables was made against flies, while several officers who ate at tables not so protected contracted the fever. Had time and chance permitted, I should have liked to have examined the legs of flies found on the tables and ascertained if they did not have attached to them masses of fecal matter which were full of typhoid bacilli.

FIRST OHIO VOLUNTEER CAVALRY.

We are indebted to Major Bunts, surgeon of this regiment, for the following facts pertaining to its history:

This regiment assembled at Columbus, Ohio, and was mustered into the service of the United States May 9, 1898. While at Columbus the drinking water used was from two wells. One of these was deep and the other shallow. The men were instructed not to use the water from the shallow well, but they did so. The water from this well was not above suspicion, and none of the water used at Columbus was boiled. Fecal matter was disposed of in sinks, the contents of which were covered each day. Major Bunts reports that there was no illness in the command during its stay at Columbus.

This regiment left Columbus, Ohio, May 13, and arrived at Chickamauga Park, Ga., May 15. It encamped on the Dyer field, quite removed from all other commands. The regimental camp was located in an open field. Water at this place was obtained from driven wells, and occasionally it was hauled from Crawfish Springs. One of the wells was soon condemned, as it was believed that it would be likely to be contaminated on account of its location. Sinks could not be dug, as a rule, more than 3 feet deep. In some places they were carried down to a depth of 5 feet. The location of sinks was more than a quarter of a mile from the wells that furnished drinking water.

The first case of typhoid fever appeared May 30. Major Bunts is quite confident that the initial date of this case should be earlier, because the man had been complaining for some days. This was an unmistakable case of typhoid fever. He was kept in the regimental hospital until June 30, and was then transferred to Leiter Hospital.

Early in July about twenty cases of typhoid fever developed suddenly in Troop H. Major Bunts explains this outbreak as follows:

This troop had its picket line on the Snodgrass place, about one-half mile away from the other picket lines. Here the men found a small pump located in a ravine not far from the place where the observation stands were erected at the time of the dedication of the park two years before. Troop H, finding this little pump and being pleased with the taste of the water obtained from it, used water from this source largely. They endeavored to keep the knowledge of this source of water supply from the other troops. Orders had been issued forbidding the use of water from these shallow wells.

While Troop H suffered most severely at Chickamauga, no troop of this regiment wholly escaped typhoid fever while there.

On July 13 this command left Chickamauga Park and went to Lakeland, Fla. On the journey and after arriving at Lakeland cases, especially from Troop H, continued to appear.

The water supply at Lakeland was taken from driven wells which were from 30 to 40 feet deep. The tubes for these wells were driven in the sand and did not pass through any impervious geological formation. Five cases developed in Troop H before leaving Chickamauga Park and 15 cases soon after reaching Lakeland. Major Bunts stated that in all there were 9 cases of recognized typhoid fever in the regiment during its stay at Chick-

amauga; but the study of the sick reports shows, as has been stated, that the number of cases was much larger than that given.

At Lakeland the camp was on a slightly elevated ridge between two lakes or swamps. The nearest of these was about 300 yards from the regimental lines and the other about a quarter of a mile distant.

This regiment left Lakeland, Fla., August 20, and proceeded to Huntsville, Ala. When this regiment left Lakeland 68 cases of typhoid fever remained in the hospital at that place. From the time of its leaving Lakeland to the date of our inspection of this command at Huntsville, September 7, 1898, 112 additional cases had developed, making up to that time 180 cases of typhoid fever, not including those left at Chickamauga when the command went to Lakeland. How much longer typhoid fever continued to develop in this regiment we do not know, as we have not gone over the sick reports of this command for this period.

The main features concerning typhoid fever in this regiment may be summed up as follows:

This command became infected with typhoid fever at Columbus, Ohio. It carried this infection to Chickamauga and possibly infected its water supply at that place. At any rate typhoid fever became quite prevalent, especially in Troop H, during the stay of this command at Chickamauga. It went to Lakeland, Fla., July 13, carrying with it many men already infected with typhoid fever. At Lakeland its water supply was obtained from a sand bed upon which the regiment encamped and in which its sinks were located. Occasional cases continued to develop at Lakeland and about August 5 the disease became widely prevalent. It is more than likely that the wells at Lakeland became infected and the 180 cases, developed in August at this place and at Huntsville, were due to the water infection at Lakeland.

SUMMARY.

Assembled at Columbus, Ohio, in April and May, 1898.	
Mustered into United States service May 9, 1898.	
Arrived at Chickamauga Park, Ga., May 15, 1898.	
Strength on arrival, 830.	
Date of first case of probable typhoid fever May 11, 1898.	
Date of first case of recognized typhoid fever July 4, 1898.	
Left Chickamauga Park, Ga., July 13, 1898.	
Strength on departure, 833.	
Number of cases of probable typhoid fever developed at Chickamauga.....	9
Number of cases of probable typhoid fever developed after leaving Chickamauga.....	180
<hr/>	
Total number of cases of probable typhoid fever developed in the First Ohio Volunteer Cavalry from May to September, 1898.....	189

The following is a list of deaths in this regiment:

- No. 1. Private of Troop F, died of typhoid fever at Lakeland, Fla., August 25, 1898.
 No. 2. Private of Troop F, died of typhoid fever at Lakeland, Fla., August 30, 1898.

No. 3. Private of Troop D, died of typhoid fever at Huntsville, Ala., September 4, 1898.

No. 4. Corporal of Troop F, died of typhoid fever at Lakeland, Fla., September 5, 1898.

No. 5. Private of Troop G, died of typhoid fever at Huntsville, Ala., September 7, 1898.

No. 6. Private of Troop C, died of typhoid fever at Huntsville, Ala., September 16, 1898.

No. 7. Private of Troop F, died of typhoid fever at Eaton, Ohio, while on furlough, September 23, 1898.

This command consisted of eight troops and had a maximum strength of 866, besides civilian employees. There were about 189 cases of typhoid fever, so far as we can learn, in this command.

Total deaths 7
 Deaths due to typhoid fever..... 7

Percentage of deaths among probable cases (189) of typhoid fever,^a 3.70.

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST OHIO VOLUNTEER CAVALRY.

Medical officers:

Frank E. Bunts, major and surgeon, Cleveland, Ohio.

Charles H. Castle, captain and assistant surgeon, Cincinnati, Ohio.

Major Bunts has furnished us with the following notes after reading our history of this regiment:

(1) The case which had its probable origin in Columbus was in B Troop, situated seven troop streets from H Troop. This man was put into the hospital a few days after our arrival at Chickamauga, and in no way could have contaminated the water supply of H Troop, which was far removed from all others.

(2) It should be known that our regimental camp at Lakeland, Fla., was just across the road from the camp of a portion of the First United States Cavalry and that several deaths had already occurred in that regiment before we arrived. Flies were very abundant in this camp.

(3) I am not sure that all of the 112 cases were genuine typhoid. Aside from about 40 of our worst fever cases that were taken care of at the regimental hospital at Huntsville, most of the cases that were sent to corps reserve hospital or sent home were marked "continued fever," as they were transferred immediately upon discovery of fever and before a positive diagnosis could be made. Many of these cases I learned afterwards proved to be genuine typhoid fever, though a few turned out to be less serious.

(4) The date of the first case of typhoid fever is improperly given. Private Teeple, of B Troop, was taken ill with this disease about May 30 and was transferred as a convalescent to Leiter Hospital. While it is possible that Teeple contracted typhoid fever at Columbus, thirteen days passed after leaving that place before he was taken ill.

Captain Castle has furnished us with quite a complete history of this regiment, from which we make the following excerpts:

In the first place, Captain Castle complains because the examination of the recruits was simply perfunctory and many men were allowed to enlist who did not physically comply with the requirements. Men under weight, some with deformed feet, and some with hernia were accepted. At the State encampment at Columbus

^aIt is quite certain that we have not a full report of deaths in this regiment.

there was a mild epidemic of catarrhal conjunctivitis. One case of pneumonia developed on the way from Columbus to Chickamauga. This man was a civilian employee, and was immediately transferred to the hospital attached to the headquarters of the commanding general. He made a speedy recovery, and this was the only case of fibrinous pneumonia developed in this regiment. The ground assigned to this regiment at Chickamauga was most excellent. It sloped in many terraces from a wooded ridge and spread out bare of trees and carpeted with close turf, which scarcely concealed the red clay beneath. In clear weather the sun kept the camp sweet and clean and in rainy weather the water drained off rapidly into a small run between the camp and its sinks.

I believe that in this encampment of instruction at Chickamauga regimental commanders and general officers must have learned that a plain, even under a blazing sun, is better for the health and comfort of the soldiers than the woodland.

During the first ten days at Chickamauga the medical department had two difficulties to contend with. One was the delay in furnishing the troops with fresh beef and keeping them on the travel rations until their hitherto untried digestions were thoroughly upset. Second: Procuring hospital tents.

About May 20 our first case of typhoid fever developed. This soldier had arrived at Columbus, Ohio, from his home in Zanesville, Ohio, and had left the regiment on May 14, arriving in Chickamauga May 15. This history locates the place of infection at Columbus. The date of infection of this was May 11, and was therefore an imported case. I believe that a search through the regimental records for the months of May and June will show that many cases were brought to the camp from the large cities in the country. The diagnosis in this case was made early. It then pursued a typical course of moderate severity, and precautions were taken against the spread of the infection from the hospital sink, but unfortunately it was not as far from the hospital as it should have been; this was due to the "lay of the land." It was sunk 7 feet deep in very hard clay, and its contents could not contaminate any neighboring water supply. Fresh earth was thrown in every morning and not infrequently a coating of chloride of lime was added. When approaching the surface the pit was filled in, a similar sink dug close at hand, and the shelter moved to cover it. The probability of contagion being conveyed on the feet of flies, however, has some weight added to it by a case developing among our hospital attendants in the early part of July, and we sent our first case to the Leiter General Hospital. The water of the well from which the last man habitually drank was not known to have caused another case of typhoid fever, whereas the possibility of flies from the hospital sinks reaching the dining tables was not at all remote. The health of the command in the month of June and the early part of July was excellent, the average in hospital being about 6, and most of these were digestive disturbances. We saw no malaria, and from my knowledge of the park I do not believe that this disease prevails there. However, during the second week in July a fever of severe and pronounced type made its appearance. Four out of the five cases of this disease occurred in Troop H.

This troop had its picket line at the opposite side of the camp from the other seven troops, and near the isolated picket line was the platform from which the park dedication ceremonies had been held two years before, and close to this, in the bottom of a hollow which drains the hillsides, was an old well with a pump. These dedication ceremonies had been attended by several thousand people, mostly from the cities of Ohio, Kentucky, Indiana, Illinois, and from various parts of the South. Typhoid fever being endemic in practically all cities, wherever several thousand people come to-

gether there will be among them many incipient cases of this disease. The rains and snows of two years had probably collected in the well the infective material deposited near by at the time of the dedication service. Water was so difficult to get that the finding of this well by Troop H was regarded as a "snap" and so kept secret. I believe that the water from this well was infected and caused typhoid fever.

When this regiment started for Florida all cases of typhoid fever were sent to Leiter Hospital, but others developed during the journey.

At Lakeland the camp was pitched in a pine grove. Trees were tall, covered with moss, and sparsely scattered over the ground, so as to admit a fair amount of sun. The ground was covered with a thick carpet of pine needles, which, until they had been removed, retained much moisture from the two or three showers that never failed. This excess of moisture made the first few days in this camp seem like living in a steam bath. However, this condition was improved by clearing off the ground and enabling the sun to dry it out. We reached Lakeland with 5 cases of typhoid fever, 2 in delirium; 1 case of simple continued fever; 1 case of acute articular rheumatism, and 1 case of orchitis.

Notwithstanding the abundance of water (for there were sixteen lakes in the vicinity of Lakeland) the water question was a most serious one. Overlying the coral reef, which forms the rocky foundation in this part of Florida, is a bed of clay, and over this again forms a surface soil of sand of variable depth. In the hollows and small valleys where the sand is not piled too high lie the lakes, and everywhere under the sand is this surface water on a level with the water of the lakes and undoubtedly making one large body of water, parts of which are concealed and parts exposed. Daily showers wash the surface sand ridges into the lakes and through the sand into the subterranean basins. Daily evaporation under the semitropical sun prevents the ground from being inundated. We tried in several places to drive wells on higher ground in and about the camp, but here we could get nothing except wet sand, and the pumps speedily choked, and finally we were compelled to approach within 200 feet of the lake, where finally a well driven 28 feet deep gave us a free flow of water. This water was to be boiled before being used for drinking purposes, and the troops kept tubs of boiled water standing in convenient places in the troop streets constantly. But it seems next to his bravery the one distinctive characteristic of the American soldier is his aversion to boiled water and his determination never to drink it under any circumstances. About the officers, most of them had quantities of boiled water which they consumed in the form of iced tea, coffee, cocoa, soups, and we shall see presently that the percentage of sickness was very small. For ten days following our arrival at Lakeland we received one daily addition of typhoid fever. All of these cases were infected at Chickamauga, and the disease ceased to develop as we reached the limits of the period of incubation.

On July 18 we received 2; July 19, 2; July 20, 2; July 22, 3; July 23, 2; July 24, 1; July 25, 2; July 26, 2.

Captain Castle is of the opinion that typhoid fever from the Chickamauga infection ceased July 31 and the epidemic from Lakeland infection began August 1. He states:

On August 1 we had 18 cases in hospital; on August 7, 23 cases; on August 10, 32 cases; on August 15, 39 cases; on August 18, 60 cases; and on August 21 (the day after the regiment left for Huntsville, Ala.), 70 cases.

When the regiment left Lakeland for Huntsville an attempt was made to retain all the sick, even suspicious cases, but the men were so anxious to get away from Florida that when the regiment arrived at Huntsville it

was found necessary to send more than twenty patients immediately to the hospital.

In speaking of the Lakeland cases, Captain Castle states:

A very large proportion of the cases—fully two-thirds—presented themselves at sick call with flushed faces and suffused eyes, bounding pulses, coated tongues and anorexia, nausea, usually diarrhea, intense headache, and backache. Most of these men stated that they had been sleepless for one or two weeks preceding. They showed diffused tenderness over the abdomen and had a temperature of from 103° to 105° F. There was a history of sudden onset of headache and backache, usually with a chill. Placed in cots in the hospital and fed on milk with small doses of acetanilid and soda to settle the stomach, a large number of these cases was vastly improved at the end of forty-eight hours. The temperature dropped, sometimes almost to normal. Some little sleep was obtained and the abdomen was less tender and there was less headache and the patient evidently felt better. In short the clinical picture was that the disease set in suddenly with apparent febrile symptoms and marked gastric disorder, vomiting sometimes of a bloody material, and albuminous urine, and this was close enough to Osler's description of yellow fever. Therefore, I thought it best to call for a consultation with an expert in the diagnosis and management of the disease.

I made a statement of the case by mail to the chief surgeon of the corps and in a few days Passed Assistant Surgeon Glennan, of the Marine Hospital Corps, was sent to inspect our sick. He pronounced our cases typhoid fever. He assured me he would rather have yellow fever than the type of typhoid fever seen in the various camps that he had inspected. He denied that I could find a good published account of yellow fever, and gave graphic descriptions of the diagnostic points that I do not believe I will forget. After this preliminary puzzling outbreak of the disease all of the cases settled down into the dreary monotony of continued fever and exhaustion which we know so well. Undoubtedly one of the causes for the widespread epidemic of typhoid fever was to be found in the condition of the intestinal tract of most of the soldiers, and this condition was not so frequent among the officers as it was among the enlisted men. This condition was a subacute or chronic intestinal indigestion and diarrhea, and officers and men were subjected to the same condition as regards climate, clothing, and the general hygienic surroundings. The officers were not so crowded in their sleeping quarters. They were not subjected to the hard manual labor that the men frequently were, and were not compelled to eat army rations, but had to supply their table at their own expense. We have seen in this particular regiment the men drank unboiled water and the officers drank boiled water, but there was probably something more than this that was an active factor in the prevalent diarrhea. I have been long of the opinion that the bacon furnished to the Army is absolutely unfit for human food. Villainous to the taste organs of most civilized people, if not impossible of digestion, and clearly of small nutritive value, as we see by studying those who make it a staple of diet.

We never used any of the canned roast beef that has produced such a controversy. As for the refrigerated beef, it was very difficult to keep, and decomposition with the formation of ptomaines sometimes took place in an hour or so.

Our first death occurred August 25, and resulted from shock due to perforation. The second death occurred August 31, and was due to typhoid toxemia. Petechiæ were almost universally distributed subcutaneously. The urine became smoky and finally there was complete suppression. There were intestinal hemorrhages, followed by coma. The third fatal case developed submaxillary abscesses, followed by septic symptoms. Another case promised a fatal result from profuse hemorrhage, but copious hypodermoclysis and long-continued narcotism I believe saved his life. More or less copious intestinal hemorrhage occurred in fif-

teen cases. In quite a number of cases that recovered the temperature ranged as high as 105° and 106° F. on several occasions. Delirium was quite a frequent accompaniment of the disease. Thrombosis of the veins of the lower extremities occurred in only two cases that I know of.

The treatment of these cases was simple. The patients were lying under the awnings in the open air, for the walls and flies of the tents were never dropped unless during the drifting rains, and then only on the side toward the rain, to be raised as soon as the sun shone again. Sponge baths were given for temperatures of over 103.5°. Bismuth was administered for diarrhea. Injections were employed for constipation. Strychnia was administered for asthenia and failing heart. Whisky was given as a food and as a stimulant.

In regard to the condition of the regiment on and after its arrival at Huntsville, Major Bunts has furnished us with the following statement:

I reached Huntsville a day in advance of the regiment, and, fearing that some might be taken sick on the way, I rented a large room in one of the hotels and bought cots, pillows, sheets, etc., enough for half a dozen patients, intending later to establish a regimental hospital out in camp. As the different sections of our train began to arrive I found that everything pertaining to the medical service, except two privates in the hospital assignment, one of whom was then under arrest, and an orderly's pouch full of medicine and one ambulance, had been left at Lakeland. The men getting off the train seemed spiritless and disheartened. Many of them threw themselves and their accouterments upon the ground and lay there until picked up by wagons hired by Doctor Izler, the assistant surgeon, and myself. The men staggered up the street and reached the hotel, and in a short time the room and beds that I had provided were filled to overflowing.

Having no tents, and realizing the immediate necessity of providing shelter and caring for the sick, I succeeded in renting a brick house and getting it cleaned and scrubbed, and I purchased cots and bedding, arranged for a supply of milk, hired a cook, secured volunteer nurses from our ranks, and by 10 o'clock that night we had established a regimental hospital, thereafter known as the Ohio Hospital, with 43 patients. Most of the cases at the hospital were pronounced typhoids, a few genuinely malarial, and one or two pneumonias. The type of fever seemed to be severe. Hemorrhage from the bowels, phlegmasia alba dolens, gluteal abscess, hemorrhoids, acute cystitis, and acute nephritis were among the complications. As a matter of interest I may add that one of the convalescents sent from Lakeland developed a relapse upon attempting to join the regiment for muster out. He narrowly escaped dying. Orchitis developed during his first convalescence, became suppurative, and necessitated an operation. I had a culture made from the pus, and it was found to contain a practically pure culture of the typhoid bacillus. Three deaths occurred during our stay at Huntsville. All of these were typhoids, and all were complicated by violent intestinal hemorrhage.

In looking over my records I find that our sick reports show from the time of our enlistment to the date of discharge that we cared for 65 cases of malaria, 88 cases of typhoid fever, and 150 cases diagnosed as continued fever. Many of the latter became pronounced typhoids while under our care at Lakeland and Huntsville. I also heard of many others after the regiment was mustered out of service, and nearly all of these were cases of typhoid fever. I think some of the cases diagnosed as malaria proved to be typhoids later.

I do not think that a case of typhoid fever developed in our regiment after reaching Huntsville that was not infected at Lakeland. When the regiment left Huntsville for home the health of those still remaining had greatly improved. About eight were still in hospital, too sick to be moved, and were left in care of Doctor Izler.

Major Bunts thinks that transportation by the hospital trains was in several instances dangerous to the lives of patients. On this point we quite agree with him.

TYPHOID FEVER IN THE LIGHT ARTILLERY BRIGADE OF
THE FIRST ARMY CORPS.

LIGHT ARTILLERY BRIGADE OF THE FIRST ARMY CORPS.

Battery.	Arrived at Chickamauga.	Left Chickamauga.	Strength on leaving.	Total deaths.	Deaths from ty- phoid.
Battery A, Illinois.....	May 21	July 24	175	2	2
Twenty-seventh Indiana Battery	May 16	July 24	173	0	0
Twenty-eighth Indiana Battery..	May 16	Sept. 3	177	1	1
Battery A, Missouri.....	May 18	July 24	171	4	3
Batteries A, C, G, and H, Ohio....	May 17	Sept. 5	697	11	9
Battery B, Pennsylvania.....	May 18	July 24	176	1	1
Batteries A and B, Georgia.....	June 8	Sept. 4	324	2	1

Total strength of the Light Artillery Brigade.....	1,893
Total deaths in this brigade	21
Deaths due to typhoid fever	17

Supposing that the deaths from typhoid fever represent 7 per cent of total cases of typhoid fever, then this brigade would furnish about 242 cases of typhoid fever.

Troop H of the Sixth United States Cavalry and Company F of the Eighth United States Infantry acted as provost guard and headquarters guard at Chickamauga. Both of these organizations arrived at Chickamauga April 20. Troop H left July 23. We have not been able to ascertain the date when Company F of the Eighth United States Infantry left. Troop H numbered 65 and Company F 59 men. Two deaths from typhoid fever occurred in Troop H. We have not found any record of death from any cause in Company F.

TYPHOID FEVER IN THE SIXTH UNITED STATES
VOLUNTEER INFANTRY.

Special interest attaches to this regiment because it came into Chickamauga Park at a time when typhoid fever widely prevailed at that place. Although this command possibly brought the typhoid infection with it, it brought into the midst of a fearfully polluted and highly infected place a large number of men susceptible to the disease, and it will be interesting to ascertain the effects produced.

This regiment assembled at Knoxville, Tenn., where it was mustered into the service of the United States July 14, 1898. It remained in camp near Knoxville, at Camp Walter, until July 31. While encamped at this place it had a most excellent supply of water—that furnished West Knoxville. Fecal matter was deposited in sinks, which were fairly well policed, the contents being covered with dirt and lime twice a day. The health of the command seemed good, but soon a case of typhoid fever appeared. Very shortly after the regiment had been mustered in, one man, an athlete, who had been traveling about the country, complained of being ill and was granted sick furlough. This case

proved to be one of typhoid fever. This is another illustration, if we needed any more to convince us, that it is almost impossible to get together a regiment of volunteer soldiers without having among the men one or more infected with typhoid fever. This command reached Chickamauga Park about 11 o'clock on the night of July 31. They rested for the night near the Second Brigade of the Second Division of the Third Army Corps. The next morning they were moved near the water tower, upon ground quite remote from any occupied at the time or previously by any command. An interesting question arises here as to whether or not the one case furloughed from Knoxville was the only man in this regiment infected with typhoid fever. On the morning of August 1 eight men reported at sick call, but none of these proved to be serious. At first water was hauled from Blue Spring. Later an attempt was made to filter Chickamauga Creek water through the Berkefeld filter, but, as had happened in other regiments, the filters soon became clogged and were broken. After this they again obtained water from Blue Spring, and continued to do so as long as the regiment remained in the park.

It will thus be seen that the use of water in this regiment was limited to two sources—the piped water from Chickamauga Creek and that obtained from Blue Spring. Theoretically, all the water obtained from Chickamauga Creek was filtered; practically, this was not the case, and doubtlessly many men drank unfiltered Chickamauga Creek water. There was plenty of room about the camp; sinks were dug at a distance of more than 100 yards from the nearest tents; they had an abundance of lime, and apparently the greatest care was exercised. We have studied the records of this regiment very carefully and we find no evidence of typhoid fever in it after it reached Chickamauga until August 24, when a private from Company C was sent to the hospital of the First Division of the Third Army Corps. This case was diagnosed "malaria," and the man remained in hospital only five days, when he was discharged on furlough; but at the expiration of his furlough he was unable to return to his regiment. In all probability this was a case of typhoid fever. On August 27 another case of so-called malaria was sent to the same hospital and was furloughed four days later. Again, this man was not able to return when his furlough expired. From September 1 on, numerous cases of recognized typhoid fever were sent to Sternberg Hospital. One man admitted to Sternberg Hospital September 1 died September 5, and was probably in the second week of the disease at the time of death. This man was a sergeant and had never failed to appear at sick call in the morning with the men from his company and his company book. He expressed some solicitude about himself two days before he was sent to the hospital, or to be more explicit, on August 29.

From August 24 to October 4, the date when this regiment left Chickamauga, 98 cases of protracted fever were sent from this command to Sternberg Hospital. Eighty-six of these were diagnosed as typhoid fever, 11 as malaria, and 1 as dysentery. The man who was admitted to hospital September 1 and died September 5 was the first case of recognized typhoid fever occurring in the regiment after it reached Chickamauga. The appearance of this case caused considerable solicitude and the regiment again changed its location and its water supply.

The site selected this time was one of the best in the park, and the water was obtained from Mullis Spring, supposed to furnish an excellent water. However, as has already been seen, typhoid fever did not abate. During the month of September the total sickness in this regiment was not great. On the day that we inspected this command, 56 men presented themselves at morning sick call. Some of these were undoubtedly cases of typhoid fever, the others were intestinal ailments, mostly due to indiscretions in diet. Colonel Tyson of this regiment is a graduate of West Point and a man of large experience in the Regular Army. He was especially solicitous that his men should not acquire typhoid fever; discipline was as good as possible in a recently recruited regiment; the men were abundantly supplied with most excellent rations; the canteen was a dry one and permission to leave camp was seldom granted; the men purchased cots. The following, taken from our stenographic notes, indicates the condition in which we found this regiment:

Company sinks in best condition of any regiment at Chickamauga, but still with considerable fecal matter exposed and a good many flies around. Location, about 100 yards from mess tents. The regimental hospital is situated to north of regiment about 200 yards; the Mullis Spring intervenes. This spring is large and gives an ample supply. However, it is not as fully protected from possible contamination as it should be.

In our opinion the history of this regiment is exceedingly interesting in connection with the study of typhoid fever at Chickamauga. The records convince us that, although one case of typhoid fever had appeared at Knoxville, no other individuals in the regiment had been infected at that place. This command undoubtedly reached Chickamauga Park free from typhoid infection. More than usual care was exercised in order to protect it against this infection, the prevalence of which was at that time well known and thoroughly dreaded. Notwithstanding all the precautions taken, typhoid fever appears after the regiment has been at this place for three weeks, and within the next ten days develops into an epidemic, and within a little more than a month this command sends 86 cases of typhoid fever to the hospital. How did these men get their infection? This is an interesting question, and we wish we could answer it with certainty. However, it is

more than probable that they received this infection in diverse ways. Whether or not the general water supply of Chickamauga Park was infected we propose to discuss later, but suffice it to say, at present, that this was possibly a source of infection in this regiment. In the second place, details from this regiment acted as guards at Sternberg Hospital, where they came in contact with infected orderlies and most likely received food and drink from the hands of men whose business it was to dispose of the excretions of typhoid patients. In moving about the park in any direction whatsoever these men were likely to soil their feet with infected filth.

On the morning of October 6, 1898, this regiment broke camp and took train for Jersey City, N. J., arriving at this place on the evening of October 8. On the morning of October 9 it embarked on the transport *Mississippi* and sailed for San Juan, P. R., arriving on the morning of October 15, but not landing until the morning of October 17. Captain Massey states in his comments on the October report that no one reported sick during the voyage. It seems rather strange that a regiment which was daily sending one or more cases of typhoid fever to the hospital should on taking train at Chickamauga and going by train and boat to Porto Rico suddenly and absolutely cease to have any sick. If we could know positively that this statement is correct it would be a most interesting one. However, the statement is not true, as can be shown by the records of the surgeon that made it. He himself reports for the remainder of the month after leaving Chickamauga 17 cases of recognized typhoid fever. Two of these, according to the record, had their initial date on October 16, the others occurring from this time up to October 31. Now, it is certainly almost unbelievable that with one or more cases of typhoid fever occurring every day up to October 6, the date of leaving Chickamauga, there should have been no other cases until October 16, after the regiment had reached Porto Rico but before it had landed. Undoubtedly some of these men were not well during the voyage, but the records do not state this. Closer study of the records, however, shows that men were sick during the voyage. The following cases will illustrate:

No. 1. Company D: Continued fever, October 13; transferred to hospital at Arecibo October 31.

No. 2. Company E: Continued fever, October 15; transferred to hospital at Arecibo October 31.

No. 3. Company M: Continued fever, October 15; transferred to hospital at Arecibo without date.

Further than this the record will show that at least one man sick with continued fever (most likely typhoid fever) was carried from Chickamauga to Porto Rico. Indeed, the records show several cases of this kind.

No. 4. Company E: Continued fever, September 24; transferred to Arecibo October 19.

Moreover, another man is reported convalescing from typhoid fever October 26 and as being sent to the hospital at San Juan on that date as a typhoid fever convalescent.

Thirty-four cases of recognized typhoid fever occurred in this regiment from the time it reached Porto Rico up to December. The last case of recognized typhoid fever found in the December report had its initial date December 10. We do not mean to infer from this necessarily that typhoid fever disappeared after this time. We have not consulted records later than December. During the same time 94 cases of malaria were reported and 50 cases of intestinal disorders. We will not attempt to determine the exact number of cases of typhoid fever in this regiment. We think that the introduction of its history at this point has served a good purpose, inasmuch as it has shown that a regiment of susceptible men going into Chickamauga Park at a time when it was highly infected with typhoid fever within about three weeks became so badly infected that the disease prevailed in an epidemic form.

SUMMARY.

Assembled at Knoxville, Tenn., early in July, 1898.

Mustered into United States service July 14, 1898.

Date of first case of probable typhoid fever about July 21, 1898.

Date of first case of recognized typhoid fever about July 21, 1898.

Arrived at Chickamauga Park, Ga., July 31, 1898.

Strength on arrival, 1,017.

Number of cases of probable typhoid fever developed at Knoxville.....	1
Date of first case of probable typhoid fever after reaching Chickamauga, August 24, 1898.	
Date of first case of recognized typhoid fever after reaching Chickamauga, September 1, 1898.	
Left Chickamauga Park, Ga., October 6, 1898.	
Number of cases of typhoid fever developed at Chickamauga..	98
Reached San Juan, P. R., October 17, 1898.	
Number of cases of recognized typhoid fever developed during voyage.....	3
Number of cases of recognized typhoid fever developed after reaching Porto Rico	31
Total number of cases of typhoid fever developed in the Sixth United States Volunteer Infantry from July to December, 1898	133
These 133 cases were diagnosed as follows:	
Typhoid fever.....	121
Malaria.....	11
Dysentery	1
Total	133

COMMUNICATIONS FROM THE SURGEONS OF THE SIXTH UNITED STATES VOLUNTEER INFANTRY.

Medical officers.

Frank P. Robinson, major and surgeon, Greenville, Tenn.

Zachary D. Massey, first lieutenant and assistant surgeon, Sevierville, Tenn.

John W. Cox, first lieutenant and assistant surgeon, Bristol, Tenn.

Under date of July 19, 1899, Lieutenant Cox forwarded to us a communication, from which the following has been extracted:

My opinion is that the most potent causes of typhoid fever at Chickamauga was the great number of flies which alternately visited the privy vaults and the mess tents. Time and again I saw flies with lime on them fresh from the vaults.

After reaching Porto Rico our first camp was at Arecibo. Here we went into quarters October 17, 1898, and remained until February 11, 1899. At this place cistern water was used. We had pit, from 15 to 20 feet deep. There were but few flies, and the sanitation of this camp was superb. From about February 16 to March 15, 1899, we were at Camp Onward, Savannah, Ga., where the regiment was mustered out of the service. Here the city water was supplied and the sanitation was good. We had no typhoid fever after leaving Chickamauga, except among men who became infected at that place. There were about thirty of these, with four deaths. Allow me to suggest from my experience that in order to avoid an outbreak of typhoid fever in an army it is necessary to boil all water; after boiling it should be thoroughly cooled and should be drawn from the containers through spigots; all rations must be protected from flies by screens.

TYPHOID FEVER IN THE EIGHTH UNITED STATES VOLUNTEER INFANTRY

We are interested in this regiment because it went to Chickamauga Park a few days after the departure of the Sixth United States Volunteer Infantry, and because the claim has been made that this regiment had no typhoid fever at any time. For these reasons we will go somewhat minutely into its medical history.

The Eighth United States Volunteer Infantry consisted of a regiment of colored troops recruited largely in Kentucky. The first report covers the month of August, 1898.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,024
Admissions:	
From command	92
By transfer.....	1
Total to be accounted for.....	93
Disposition:	
Returned to duty.....	93
Remaining in regimental hospital.....	6
Remaining in quarters	19
Total	118

It would seem from these figures that there was a total sickness during the first month of the existence of this regiment of 118, and that 25 of these cases were incomplete at the end of the month. At least, this is the interpretation we place upon the somewhat confusing mixture of figures found on the face of the sick report. This report is signed by James Hepburn, surgeon, who makes the following statement:

The case of Private William McClendon, Company F, is probably of tubercular origin, as is also the case of Private Henry

Anderson, Company F. Private John Morgan, Company M, was bitten by a man, causing a lacerated wound of the first and second fingers of the right hand.

In the August report we find one case of recognized typhoid fever. This man is reported as being convalescent from typhoid fever. The case is registered as follows:

Conner, George P. H. August 1, convalescent from typhoid; returned to company August 19.

In the August report there are 13 cases diagnosed as malaria. Two of these, whose cases are designated as "intermittent quotidian," were off duty for twenty-four days.

In the August report there are 10 cases of diarrhea, but none of these were of sufficient duration to lead us to suspect that they were cases of typhoid fever. It will thus be seen that the number of probable cases of typhoid fever in this regiment during August was 3 and the number of recognized cases 1.

On September 1, 1898, this regiment was increased by two companies of the Indiana Volunteer Colored Infantry. These companies consisted of 208 enlisted men and 6 commissioned officers, all colored. These two organizations continued as one regiment until they were mustered out of service.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,217
Admissions:	
Remaining from last month	20
From command	47
Otherwise	9
Total to be accounted for	76
Disposition:	
Returned to duty	73
Discharged for disability	5
Transferred to other hospitals	1
Remaining in regimental hospital	3
Remaining in quarters	8
Total	90

It will be seen that the figures for "admission" and "disposition" do not balance. This report is signed by Major Hepburn without comment. There was no case of recognized typhoid fever in this regiment during September. There were 5 cases of malaria, only 1 of which was of more than ten days' duration. This man was admitted to sick report September 9 and was returned to duty September 21. Under the head of intestinal disorders one man is recorded in this month's report as having been admitted to sick report August 15 with dysentery, and remained off duty until September 18. These are, so far as we can ascertain, the only possible cases of typhoid fever in the September report.

During the months of August and September and up to October 8 this command was stationed at Fort Thomas, Ky. On October 8 it left this place and arrived at Camp George H. Thomas, Chickamauga Park, Ga., October 10. It will thus be seen that the Eighth United States Volunteer Infantry arrived at Chickamauga Park four days after the Sixth United States Volunteer Infantry left this place. It will be of interest to ascertain whether this new command, coming upon the ground with but little typhoid fever, acquired the disease; and if so, to what extent.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	1,174
Admissions:	
Remaining from last month	8
From command	58
Civilian	1
Total	(?) 66
Disposition:	
Returned to duty	44
Died (civilian)	1
Discharged for disability	12
Transferred to other hospitals	2
Remaining in hospital	11
Remaining in quarters	9
Total	79

The fault in mathematics of this surgeon is again indicated. This report is signed by Major Hepburn with the following remark:

Until October 8 this command was located at Fort Thomas, Ky. It arrived at Camp George H. Thomas, Chickamauga, Ga., October 10.

In the October report there are two cases of recognized typhoid fever. The initial date of one of these is October 1, before the regiment left Fort Thomas; the initial date of the other case is October 25, while the regiment was in Chickamauga Park. It will be seen from this that the statement that this regiment did not develop a case of typhoid fever while at Chickamauga Park is erroneous. The disposition of this case is not given in the report. Of the three cases of malaria reported in October, one had its initial date before the regiment reached Chickamauga, the other two afterwards. The disposition of the two that developed after reaching Chickamauga is not given, but there is no record of these men returning to their regiment at any time. Four cases diagnosed as dysentery and one as gastritis in the October report remained off duty for more than two weeks, and two of them (both diagnosed as dysentery) never returned to their regiment, or at least there is no record of their having done so. Another case was reported without diagnosis, and there is no record of this man returning to the regiment.

CONDENSED SICK REPORT FOR NOVEMBER.

Mean strength, 1,219.

Under the head of "admissions" there are no figures. It must not be inferred from this that there was no sickness in this command during November, for we find the following, under the head of "disposition:"

Returned to duty	84
Discharged for disability	5
Deserted	4
Transferred to other hospitals	1
Remaining in regimental hospital	18
Remaining in quarters	23
Total	135

There is no case of recognized typhoid fever in the November report. Under the diagnosis of malaria there are two cases of more than three weeks' duration. Six cases of undiagnosed fever are reported, and none of these had returned to duty up to December 31, 1898.

CONDENSED SICK REPORT FOR DECEMBER.

Mean strength	1,227
Admissions:	
Remaining from last month	27
From command	157
Total to be accounted for	184
Disposition:	
Returned to duty	155
Remaining in regimental hospital	13
Remaining sick in quarters	23
Total	191

In this report Major Hepburn states:

The prevailing diseases during this month have been measles and la grippe, with their usual sequelae. All cases of measles have been isolated in a separate ward provided for that disease, and all clothing and bedding disinfected before the patients were returned to quarters.

In the December report the return of three men convalescent from typhoid fever is recorded. Two of these men were taken sick before the regiment left Fort Thomas, and therefore are not of special interest to us in our study of typhoid fever at Chickamauga. The third case reported as being convalescent from typhoid fever belonged to the Indiana companies, and there is no information concerning the initial date of his illness. We can therefore say that no recognized typhoid fever developed in December. Three cases of malaria were suspiciously prolonged, and the same is true of one case of gastritis and one of undetermined fever.

We conclude from the study of this regiment that, while it was not altogether free from typhoid fever, its condition, so far as this disease is concerned, was not rendered worse by its going to Chickamauga Park. The conclusion reached after the above study of typhoid fever in the Eighth United States Volunteer Infantry is strengthened by the following letter from Gen. H. V. Boynton, chief of the Park Commission:

CAMP THOMAS, GA., November 2, 1898.

Maj. WALTER REED,

Chairman of Typhoid Board, Washington, D. C.

DEAR MAJOR: You asked me to keep you informed in regard to the health of our working force in the park. The situation is this: We have had employed 150 men for two months. They have filled up 3,175 sinks. About two-thirds of these sinks were left uncovered by departing troops. They have also restored all the field hospital sites. They have used water from the wells and springs of the park during the whole time that they have been engaged in this work. There has not been a case of typhoid fever or malarial fever among them, nor in our regular park force from April until the present time.

Truly, yours,

(Signed) H. V. BOYNTON.

Of course it must be borne in mind that the cool weather that prevailed after October 10 destroyed the fly as a carrier of the infection. We think that this is the probable reason why typhoid did not prevail in the Eighth United States Volunteer Infantry, and we do not believe that the comparative freedom of this regiment from typhoid fever was due to extraordinary sanitary precautions. It will be remembered that the regiments that went to Knoxville, Tenn., and Lexington, Ky., and those that came to these places from elsewhere than Chickamauga late in the season ceased to have typhoid fever in October. We believe that this is strong proof that the fly was one of the most important factors in the distribution of typhoid fever at Chickamauga.

TYPHOID FEVER AMONG HOSPITAL CORPS MEN IN THE FIRST AND THIRD ARMY CORPS.

We have been unable to obtain a statement of the strength of the Hospital Corps connected with the First and Third Army Corps. We find in the records of the various hospitals connected with the First and Third Army Corps 209 cases of recognized typhoid fever among the hospital corps men. At the time that we inspected the troops at Chickamauga Capt. H. B. Stotter was in command of the Hospital Corps. He stated that he had under his charge 110 men all told. The duties of these men consisted in acting as orderlies at Sternberg Hospital and in policing the grounds. Captain Stotter had at that time been at Chickamauga for five weeks, but had had charge of the Hospital Corps for only three weeks. In fact, he was placed in charge a short time after the opening of Sternberg Hospital. At the time of his taking charge of this corps all the men in it were on duty. At the time when he gave his testimony to us 36 were on the sick report; 16 of these were in the hospital. The prevailing diseases among the 20 in quarters were diarrhea and gastritis. Captain Stotter attributed the gastritis to the fact that these men drank too freely of infected milk. When we visited Sternberg Hospital we found the hospital corps men drinking Chickamauga Creek water from the hydrants, although this water had been

condemned. Captain Stotter attributed the diarrhea among his men to the use of this water. He reported that his men were fairly intelligent, amenable to discipline, and but little given to intoxication.

The following is an alphabetical list of total deaths among the hospital corps men connected with the First and Third Army Corps so far as we have been able to ascertain:

Name.	Rank.	Date.	Place of death.	Cause of death.
Beatty, Robert.....	Private.	1899, Feb. 26	Camp Shipp, Ala.....	Croupous pneumonia.
Bennett, Herbert H..	Private.	1898, Sept. 30	Chickamauga, Ga.....	Typhoid.
Bohn, Wm. J. (Ambulance Corps, First Division, Third Army Corps).	Private.	July 7	.....do.....	Do.
Boynton, Elihu (Ambulance Corps, Second Division, First Army Corps).	Private.	Nov. 2	Knoxville, Tenn.....	Hemorrhage of the brain.
Brock, Aaron.....	Private.	1899, Jan. 2	Anniston, Ala.....	Typhoid.
Caldwell, Robt. H....	Private.	1898, July 4	Leiter General Hospital.	Appendicitis.
Campbell, Bernard J..	Private.	Nov. 4	Sternberg United States General Hospital.	Typhoid.
Cramer, Floyd B. (Third Division, First Army Corps).	Private.	Sept. 8	Hospital Hoff, Camp Thomas, Ga.	Do.
Cummings, Guy.....	Private.	Aug. 31	Belgrade, Me.....	Do.
Dalrymple, E. W. (Ambulance Corps).	Private.	Sept. 6	General Hospital, Chickamauga, Ga.	(Typhoid); malarial fever.
Fryer, Albert F. (Third Division, First Army Corps).	Private.	Sept. 17	United States General Hospital, Camp Thomas, Ga.	Typhoid.
Grimmett, Homer....	Private.	Aug. 17	Sternberg Field Hospital, Chickamauga, Ga.	Do.
Hatcher, James C.....	Private.	Aug. 22	Sternberg Hospital, Chickamauga, Ga.	Do.
Jones, Samuel M.....	Private.	Oct. 11	Camp Shipp, Ala.....	Meningitis, cerebro-spinal.
Kenefick, Stephen A..	Private.	Nov. 3	Sternberg General Hospital.	Typhoid.
Kiger, George (Ambulance Corps).	Private.	Oct. 25	Hospital Second Division, First Army Corps, Camp Poland, Tenn.	Do.
Leib, Joseph.....	Private.	Aug. 22	Sternberg United States Field Hospital, Chickamauga, Ga.	Do.
McAllister, James T. (Second Division, First Army Corps).	Private.	Sept. 18	Hospital Second Division, First Army Corps, Camp Poland, Knoxville, Tenn.	Poison; effects of opium.
McCann, Frederick...	Private.	1899, Jan. 9	Fort McPherson, Ga..	Typhoid.
Meredith, Brenton (Ambulance Corps, First Division, Third Army Corps).	Private.	1898, Aug. 1	Leiter General Hospital.	Do.
Messer, John P.....	Private.	Aug. 27	Fort Columbus, N. Y..	Do.
Nunns, Clarence C. (Ambulance Corps, Second Division, Third Army Corps).	Private.	.....do....	Chickamauga, Ga.....	Do.
Perkins, George M. (Ambulance Corps, First Division, Third Army Corps).	Private.	Sept. 2	Camp Thomas, Ga.....	Do.
Peters, Fred W.....	(?)	Aug. 26	Sternberg General Hospital, Chickamauga, Ga.	Do.
Smith, William.....	Private.	Aug. 31	Leiter General Hospital, Chickamauga, Ga.	Do.
Wheelock, Charles F..	Private.	Dec. 3	General Hospital, Fort Thomas, Ky.	Typhoid, with hemorrhage.
Williams, E. A.....	Private.	Sept. 17	Sternberg Hospital...	Typhoid.

Deaths 27
Deaths due to typhoid fever 22

It would be interesting if we could ascertain the total number of cases of typhoid fever among the Hospital Corps men, on account of the close contact these men had with typhoid patients. It was customary during a part of the time at Chickamauga, as it was at other national encampments, to detail men from the line to serve as orderlies in the hospitals. In some places these details were made daily; in others, a detail was made for a week. At the expiration of the time for which the detail was made the men were returned to their respective regiments and other men for like purposes detailed at the hospital. This method of securing orderlies to care for patients with typhoid fever or other infectious disease is to be condemned most emphatically. Undoubtedly this was one of the means by which typhoid fever was spread through the different organizations. Men wholly ignorant of methods of disinfection were assigned to the task of caring for patients and disinfecting stools. Many of these men undoubtedly infected themselves and went back to their regiments without even disinfecting their hands. At one hospital we found that the orderlies went to their respective messes in the different regiments without washing their hands.

The following table showing the date of arrival and the initial date of illness of some of the Hospital Corps men probably has sufficient importance to justify us in giving it:

Number.	From—	Date of arrival.	Date when taken sick.	Diagnosed.
1	Columbus, Ohio.....	July 30	Sept. 8	Typhoid.
2	St. Paul, Minn.....	Aug. 1	Sept. 11	Do.
3	Fort Sheridan, Ill.....	July 31	Sept. 4	Do.
4	Fort Snelling, Minn.....	.....do....	Sept. 10	Do.
5	Columbus, Ohio.....	June 20	.....do....	Do.
6	St. Paul, Minn.....	July 30	Sept. 7	Do.
7	Columbus, Ohio.....	July 31	Aug. 29	Do.
8	.....do.....	.....do....	Sept. 6	Do.
9	Fort Sheridan, Ill.....	.....do....	Sept. 10	Do.
10	.....do.....	Aug. 19	Aug. 28	Do.
11	Columbus, Ohio.....	.....do....	Sept. 6	Do.
12	St. Paul, Minn.....	July 18	Sept. 3	Do.
13	Washington, D. C.....	June 1	Aug. 25	Do.
14	Winchester, Ky.....	Aug. 12	Sept. 8	Do.
15	Fort Sheridan, Ill.....	June 1	Sept. 10	Do.
16	Wabash, Ind.....	June 18	Aug. 31	Do.

If we could know that none of these men received the typhoid infection before reaching Chickamauga the above data might be of some value in giving information concerning the period of incubation. The shortest period intervening between the date of arrival and the initial date of sickness in the above table occurs in No. 10, where the period is only nine days. Of course it is possible that this man might have been infected before reaching Chickamauga. On arriving at this place he immediately began his duties as orderly in Sternberg Hospital, and nine days later, as seen by the figures above, came down with typhoid fever.

TYPHOID FEVER AMONG FEMALE NURSES AT
CHICKAMAUGA.

We have not been able to ascertain the number of probable cases of typhoid fever developed among the nurses caring for the sick in Sternberg and Leiter hospitals, at Chickamauga. H. C. Lounsbery, chief nurse at Sternberg Hospital, furnished us with a report of the nurses who had left that hospital up to September 13, and the reason for leaving in each case. This information might be tabulated as follows:

Num- ber.	From—	Date of arrival.	Date of depart- ure.	Reason for departure.
1	Boston, Mass	Aug. 7	Sept. 10	Sick from overwork.
2	New York City	do	Sept. 8	Diarrhea.
3	do	do	do	Do.
4	Newark, N. J.	do	Aug. 19	Hysteria.
5	Boston, Mass	Aug. 17	Sept. 13	Typhoid fever.
6	Rochester, N. Y.	do	Sept. 7	Exhaustion from diarrhea.
7	Brooklyn, N. Y.	do	do	Do.
8	do	do	Aug. 30	Do.
9	Boston, Mass	do	Sept. 7	Do.
10	Brooklyn, N. Y.	do	Sept. 13	Do.

Num- ber.	From—	Date of arrival.	Date of depart- ure.	Reason for departure.
11	Pittsburg, Pa.	Aug. 17	Sept. 7	High fever.
12	Boston, Mass	do	Aug. 26	Broken down by night work.
13	New York City	do	Aug. 23	Diarrhea.
14	do	do	Aug. 30	Dismissed, not sick.
15	do	do	Sept. 6	Diarrhea.
16	Rochester, N. Y.	do	Sept. 11	Diarrhea and suspected typhoid.
17	Cincinnati, Ohio	Aug. 25	Sept. 2	Typhoid fever.
18	Wilkesbarre, Pa.	do	Sept. 13	Do.
19	Boston, Mass	Aug. 26	do	Do.
20	St. Louis, Mo.	Aug. 27	Sept. 6	High fever.
21	Wilkesbarre, Pa.	Aug. 29	Sept. 13	Rheumatism.
22	Chicago, Ill.	Aug. 23	do	Diarrhea and high fever.
23	do	Aug. 25	do	Do.

It will be seen that No. 17 developed typhoid fever eight days after her arrival at Chickamauga, while it is not certain that this nurse was not infected on reaching Sternberg Hospital, it is highly probable that she received the infection at that place. The next shortest period before typhoid fever developed is case No. 20. This nurse developed typhoid fever ten days after her arrival.

CHAPTER VII.

GENERAL REMARKS CONCERNING TYPHOID FEVER IN THE FIRST AND THIRD ARMY CORPS.

SITE.

The surface of Chickamauga Park is gently rolling, with sufficient grade to carry away the heaviest rain-falls. There are no morasses or swamps within the park. The surface is partly cleared and partly wooded, but everywhere the undergrowth has been cut out and there is nowhere dense forest. In some places local areas are somewhat flat, and may be damp during a rainy season; especially is this true when the flat surface is covered with woods. With the exception of such localities as these, there is no part of the park where an excellent site for a regimental camp might not be secured. Most of the little streams that drain the park are dry except after rains. However, some of them are fed by springs and flow continuously. Most of the drainage from the park passes ultimately into Chickamauga Creek, which flows along the southeastern border. A large part of the park is covered with magnesian limestone, upon which there has been deposited gravel which varies in depth from a few inches to many feet. The strata of this limestone have been broken and thrown into ridges, which dip at various angles. The outcropping rock is in many places broken and fissured in every direction, so that water easily percolates through the crevices and between the layers, frequently appearing on the surface and forming wet-weather springs. When the water penetrates greater masses of rock and passes for greater distances under the surface and accumulates in larger volume, permanent springs are formed. So far as the surface and the soil are concerned, there is only one objection to Chickamauga Park as an encampment for a large body of troops. This objection lies in the difficulty universally experienced in the summer of 1898 in digging sinks of sufficient size and depth and in having proper material with which the contents of these sinks could be covered. In many places the magnesian limestone lies directly on the surface. Pits could be made only by blasting, and when thus made were of insufficient size and could not be properly eared for.

It is a matter of some surprise that so many of the regiments located at Chickamauga should have en-

camped in the wooded portions. However, as has been stated, the woods were not dense anywhere, the undergrowth having been cut out so that it was easy to drive a team through any of the wooded portions of the park. There were some reasons for the regiments locating in the wooded rather than in the open spaces. In the first place, many of the regular regiments were temporarily encamped in the park during April, 1898, before the arrival of the volunteer regiments. The regular troops left the park late in April or early in May, and most of these regiments went to Cuba. The volunteer regiments on arriving found that the most desirable sites in the open portions of the park had already been occupied by the regular commands. Recognizing the fact that it was not safe to occupy sites so recently vacated by other regiments, the volunteers felt compelled in many instances to locate in the woods. In the second place, the open spaces were reserved in part for drill grounds. There were daily regimental and brigade drills and less frequent division and corps exercises. Thirdly, some of the open fields had been leased from the Government by individuals who refused to allow the troops to occupy these lands. This necessitated negotiations, which took time, and in the meanwhile the regiments encamped in the woods. However, we do not think that a great deal of stress should be laid upon the fact that the regiments were encamped in the woods. As has been already stated, these woods were well lighted and penetrated by the rays of the sun in every part. It is possible that the site of the First Mississippi Volunteer Infantry was in a space too densely wooded.

So far as the locations of the camps are concerned, there is one criticism that must be made by anyone who knows anything of the sanitation of camps. There is no adequate reason why the regimental camp sites in Chickamauga Park should not have been changed every three weeks, and yet it is a fact that many a tent pitched there in May was not moved until the regiments dispersed late in August. The records show that regimental medical officers petitioned time and time again for a change in camp sites, and that such petitions were in many instances wholly ignored.

Everyone versed in camp sanitation knows that under the very best conditions any given site will become more or less contaminated when occupied for a few weeks, and it is strange that the desirability of frequent changes in camp sites in Chickamauga Park during the summer of 1898 was not recognized and acted upon by superior line officers.

On account of the rolling character of the surface and the geological formation already described, it sometimes happened that one regiment had its health endangered by drainage from other regiments. This was so plainly the case in the Second Division of the Third Army Corps that it is strange that it was not early recognized and that the camps of some of the regiments were not changed.

DRAINAGE.

As has already been stated, nearly every acre in the park is provided with such excellent natural drainage that the excess of water falling upon it in the heaviest rain is soon removed. Numerous small streams wind among the slightly elevated knolls and act as natural sewers. One of the larger of these streams, known as Cave Spring Branch, through its tributaries receives the drainage of a large portion of the area covered by the encampments. This stream flows into Chickamauga Creek, and the relation of the junction of these two streams to the intake of the general water supply will be discussed later. On account of the variations in dip of the layers of limestone and also on account of the crevices in the layers of this stone, the drainage is not always on the surface. Water falling on an elevated area in the park in part passes down between the tilted and broken layers of limestone and reaches the surface at the foot of the hill. If the distance underground traversed by the percolating water is short and the depth of penetration is not great, a wet-weather spring results; on the other hand, if a larger volume of water accumulates under the ground and percolates to a greater distance, a permanent spring will result. The layers of limestone rock vary much in thickness. In many places they are superimposed one directly upon the other; in other localities the layers are separated by deposits of clay almost as hard as the rock itself, so that in drilling there is no noticeable difference between the rock and clay. For the reasons already given, the waters of many of the smaller springs, of some of the larger ones, and of some of the wells, became more or less turbid after heavy rains. This can be accounted for only by contamination with surface drainage. It will be readily seen that with the conditions as here described a polluted surface necessarily led to polluted springs and wells.

WATER SUPPLY.

Through and about the park are numerous large springs, supplying an almost unlimited quantity of water

which is apparently of the very best quality. Undoubtedly, when there is no unusual surface pollution about them, the water from any and all of these springs is quite safe. However, the largest of them may be contaminated to a greater or less extent by surface drainage. Crawfish Spring, the flow of which is estimated at 60,000,000 gallons per day, sometimes becomes muddy after heavy rains. In its normal state this is one of the most beautiful springs in the world. Numerous large springs, such as Sweet Spring, Blue Spring, Georgia Mineral Spring, Rossville Spring, etc., located outside of the park, furnished drinking water for the troops. From most of these springs water was dipped in pails, the man dipping the water standing upon the edge of the spring and with the water often undoubtedly falling over his boots and possibly contaminating the source of supply. The water was hauled to the camps from these springs in headless barrels. The barrels were deposited in the camp and men dipped with clean and unclean cups, possibly with clean and unclean hands, water from these barrels, and drank it. It must be admitted that the possibilities of occasional contamination of portions of the water obtained in this way were not insignificant.

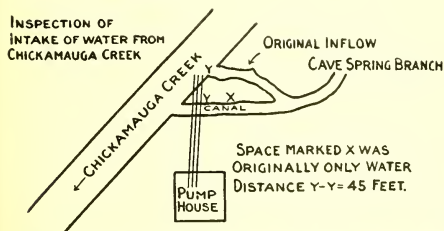
We have already referred to the wet-weather springs. We are quite confident that these were a means of infection. Especially do we believe that this was true in the Second Division of the Third Army Corps. The location of some of the regiments of this corps was such that the contamination of wet-weather springs breaking out from the base of hills occupied by them was almost absolutely certain.

There are numerous wells throughout the park. These differ considerably in construction. It is generally believed that all of the wells in the park are driven ones. However, we have already seen from the testimony of Major Hysel that this is not true of Jay's mill well. In regard to the wells General Boynton, chief commissioner of the park, made this statement to us:

We had nine driven wells here when the troops began to arrive. These had been in use two or three years. Soon we saw that the supply from these would be insufficient. We obtained five drilling machines and began to put down wells as fast as we could wherever they were wanted. Most of this drilling was done before the rainy season set in. In boring for these wells we passed through gravel and loose rock near the surface, then we struck very solid rock, which ranged in thickness from 80 to 164 feet. A few of the wells are bored through less than 80 feet, while others are carried through 164 feet of rock. In drilling there is no evidence of cavities. The water flows in when we get down to what we call the water-bearing stratum. Usually, while boring, it is found necessary to pour water into the hole to facilitate the action of the drill. After the water-bearing stratum has been reached the water rises to within 10 feet of the surface, sometimes nearer. For instance, the well at the McDuffield place, which is 168 feet deep, was perfectly dry through 164 feet of rock, and immediately as soon as we got to the water-bearing stratum it came up to within 4 feet of the surface. At the Brotherton place the well is 125 feet deep and most of it through solid rock, and the water rises to within 4 feet of the surface.

We found considerable diversity of statement concerning the inquiry as to whether or not the water from these driven wells became cloudy after heavy rains. General Boynton stated that this occurred in only three wells within the park. He thought that in the case of these it could be explained only by contamination with surface drainage. Others stated that many of the wells in the park furnished turbid water after heavy rains. We think that there can be no doubt that there must have been surface contamination of at least some of these wells, and possibly the water from these may have served as a factor in the distribution of typhoid fever. The construction of these driven wells was apparently very good. The drill made an opening of a little more than 6 inches in diameter through the solid rock. Into this hole a wrought-iron casing was driven to a sufficient depth to make it water-tight. The casing above the rock was then set in hydraulic cement. Notwithstanding this care, there can be no doubt, as stated above, that the water did occasionally become turbid, and when this happened the only explanation possible is that the turbidity was due to surface drainage.

In addition to the above-mentioned sources, water was pumped from Chickamauga Creek and distributed by means of pipes through the various organizations encamped in Chickamauga Park. The only troops that did not receive piped water from Chickamauga Creek was the Second Division of the First Army Corps. The regiments of this division were located quite distant from any of the pipes, and this water could have been used by men belonging to this division only occasionally. The intake of the water supply from Chickamauga Creek was most unfortunate, as shown by the following illustration:



We have already mentioned the fact that a small stream known as Cave Spring Branch drained a large part of the territory covered by the encampments. This stream empties into Chickamauga Creek, and the intake of the general water supply was located dangerously near the junction of these streams. In fact, the intake of the water supply was immediately at the

junction of the two streams. However, Cave Spring Branch was deflected from its course by a canal and dam, so that it emptied into Chickamauga Creek about 45 feet below the mouth of the intake pipes. The first attempt to deflect Cave Spring Branch consisted of a flimsy riprap wall consisting of brush and broken stones. This poorly constructed dike was washed away by the first heavy rain, and Cave Spring Branch resumed its original course and flowed into Chickamauga Creek directly around the mouth of the three intake pipes. There certainly was no adequate excuse for taking the water from this point, and there can be but little doubt that the water supplied through the pipes did on more than one occasion become contaminated with the drainage from the camps flowing into Chickamauga Creek through Cave Spring Branch. With typhoid fever generally distributed through the regiments, the infection, as we have already seen, being brought to the park by most of the regiments, and with the drainage from all of these camps swept into this stream, it is impossible that the water of Cave Spring Branch should have escaped specific contamination with the typhoid bacillus, and it is well-nigh impossible that the water of Chickamauga Creek pumped through the pipes and distributed through the camps altogether escaped this contamination. In our opinion, there is but little doubt that the general water supply at Chickamauga became slightly contaminated. However, we are convinced from the distribution of the disease through the different organizations that contamination of the water supply was only one of the means through which the disease was spread. Moreover, as we have already seen, the Second Division of the First Army Corps was quite removed in its location from the water mains and pipes, and the men of this division could only occasionally reach this water, and yet this division suffered like the others from typhoid fever. For these and other reasons that have already been given, we are inclined to think that infected water was not the chief source of the spread of typhoid fever among the troops encamped at Chickamauga.

Unfortunately no satisfactory bacteriological examination of any of the waters used by the troops at Chickamauga was made at the proper time. On August 5, 1898, Professor Slocum, of Knoxville, Tenn., made a chemical analysis of 43 samples of water taken from various sources in the park. This analysis consisted of a determination of the amount of oxygen consumed. While we do not place any stress upon the value of these analyses, inasmuch as the evidence furnished is not convincing, we think ourselves justified in presenting in the following tabular form the results of Professor Slocum's work:

Results of analyses of water from various sources used by the troops in Camp George H. Thomas, Chickamauga Park, Ga.

No.	Source.	Location of same.	Oxygen consumed in 100,000 parts.	Quality of water.		No.	Source.	Location of same.	Oxygen consumed in 100,000 parts.	Quality of water.	
1	Well....	Brotherton road at Howell's Battery.	0.26	Impure...	Cased well; not used.	23	Well....	Bagwell's store	0.07	Pure.....	Open dug well.
2	Spring..	Jays Mill .....	.09	Pure.....		24	Spring..	White Smith's near Ravine.	.15	Doubtful purity.	Shallow dug well. Use stopped early.
3	Well....	Alexander road at "Tom Little's," Twelfth Minnesota.	.06	.....do....	Cased well.	25	Well....	Brannan's house yard (old well).	.20	.....do....	Shallow dug well. Used by troops.
4	....do....	Vinyard-Alexander road, Walthall shop.	.09	.....do....	Do.	26	....do....	Brannan's front yard ...	.24	.....do....	Cased well, finished among last.
5	Spring..	Mullis, north end of park.	.10	.....do....		27	....do....	Benton's house yard...	.07	Pure.....	Shallow dug well.
6	Well....	Dyer house yard.....	.04	.....do....	Do.	28	....do....	Alexander bridge road between Winfrey and Benton's.	.01	.....do....	Cased well.
7	Spring..	Blue, over Chickamauga Creek.	.13	.....do....		29	Spring..	Brook .....	.20	Doubtful purity.	Deep spring. Use stopped early.
8	....do....	Ellis, on Ringgold road	.04	.....do....		30	Well....	Poe field northeast of Georgia monument.	.06	Pure.....	Cased well.
9	....do....	Cloud, on Lafayette road.	.10	.....do....		31	....do....	Poe field east of Georgia monument.		Sample broken.	Do.
10	Well....	Reeds Branch road southwest of Brannan's, One hundred and sixtieth Indiana.	.10	.....do....	Do.	32	....do....	Lafayette road, Kelly house.	.06	Pure.....	Do.
11	....do....	Dyer House, west of, near spring.	.10	.....do....	Do.	33	....do....	Glenn-Kelly and Baird roads, Dyer field.	.03	.....do....	Do.
12	Spring..	Dyer's, west of house....	.21	Impure...	Stoek only.	34	Spring..	Dyer field at water oak .	.09	.....do....	Bold shallow spring.
13	Well....	Wood's yard .....	.09	Pure.....	Cased well.	35	Well....	Lafayette road north of Kelly house.	.03	.....do....	Cased well.
14	....do....	Brotherton road at old county road.	.03	.....do....	Do.	36	....do....	Lafayette and Alexander roads.	.10	.....do....	Do.
15	....do....	Brotherton road at Bragg's headquarters.	.17	Doubtful purity.	Cased well. Use stopped, but declared good after analysis by Philadelphia board of health or water board.	37	....do....	Lafayette and Reed's bridge roads.	.10	.....do....	Do.
16	....do....	Lafayette road south of Saw Mill Fork.	.06	Pure.....	Cased well.	38	....do....	Glenn-Kelly and Snodgrass roads.	.10	.....do....	Do.
17	....do....	Brotherton road at Jays Mill junction.	.07	.....do....	Do.	39	Pipeline	.....	.03	Medium purity.	Pipe line, Chickamauga Creek.
18	....do....	Vinyard house yard ....	.16	Medium purity.	Open dug well.	40	Well....	Rostrum foot of Snodgrass Hill.	.15	Doubtful purity.	Cased well; not used.
19	....do....	Reeds Branch road .....	.21	Impure...	Cased well.	41	....do....	Vittetoe roads near Vittetoes.	.03	Pure.....	Cased well.
20	....do....	Brotherton House.....	.03	Pure	Do.	42	....do....	Lytle Hill, on Glenn-Kelly road.	.42	.....do....	Do.
21	....do....	Lafayette road, 250 yards south of Brotherton's.	.09	.....do....	Do.	43	Spring..	Scott's, south of Vinyard's.	.10	.....do....	Large, shallow, open spring.
22	....do....	Jays Mill road north of Alexander road....	.04	.....do....	Do.						

Classification of Frankland and Tidy.

Oxygen consumed in 100,000 parts of water:

Section 1. Upland surface water:

Class 1. Water, great organic purity not more than	0.1
2. Water, medium purity not more than .....	.21
3. Water, doubtful purity not more than .....	.4
4. Water, impure more than .....	.4

Section 2. Deep wells and springs:

Class 1. Water, great organic purity not more than ....	.055
2. Water, medium purity not more than .....	.15
3. Water, doubtful purity not more than .....	.2
4. Water, impure more than .....	.2

In September, 1898, Acting Assistant Surgeon Carroll, under the direction of our board, collected samples of water from various sources in Chickamauga Park, and submitted the same to bacteriological examination.

Of course we understand that the bacterial flora of these waters in September does not represent the condition of the same waters in August. However, we had the waters examined as soon as we were able to do so. We publish in the attached tables the results of Doctor Carroll's work. It will be seen that he found the bacillus pyocyaneus in many of these waters. We do not know that any importance whatever is to be attached to the wide distribution of this bacillus in the waters of Chickamauga Park, nor shall we attempt to draw any conclusions therefrom. This organism has been found occasionally in the drinking water supplied to various cities. We give the results of Doctor Carroll's work without further comment:

Results obtained with water from Camp George H. Thomas,

No.	Location of well or spring.	4th-day culture at 39° to 41° C.	G. pig.	Died.
			<i>Grams.</i>	
1	At foot of Lytle Hill (headquarters)	Plain bouillon....	350	17 hours
2	Headquarters well; outside	1 c. c. of plain bouillon.	460	18 hours
3	Dyer House; spring open for stock .....	..do.	425	17 hours
4	Well yard at park headquarters .....	..do.	365	..do.
5	Wood's well at park headquarters .....	..do.	470	..do.
6	Dyer field spring .....	..do.	415	25 hours
7	Well at junction of Bayard and Kelly roads .....	..do.	450	17 hours
8	At Snodgrass crossroads .....	..do.	420	..do.
9	Well at west fork of Glen-Kelly road, north of Snodgrass crossroads .....	..do.	585	..do.
10	First well south of stone crusher, Glen-Kelly road, west fork .....	..do.	430	..do.
11	Mullis spring .....	..do.	725	..do.
12	McDonald well .....	..do.	340	..do.
13	Closed spring, said to be responsible for a number of cases; open water dipped .....	..do.	305	17 hours
14	Alexander well, Alexander and Lafayette roads .....	..do.	345	..do.
15	Glen-Kelly road, west of Kelly field .....	..do.	320	..do.
16	Kelly field well, Lafayette road .....	..do.	520	..do.
17	Kelly house well .....	..do.	570	24 hours
18	Well east of north end of Poe field; shallow well in hard rock .....	..do.	415	17 hours
19	East of Poe field, opposite Georgia State monument .....	..do.	360	..do.
20	Brotherton well, on Lafayette road .....	..do.	345	..do.
21	On Lafayette road, south of Brotherton's, near Humphries Arkansas Battery .....	..do.	495	..do.
22	Means spring, open water dipped .....	..do.	660	25 hours
23	Well on Lafayette road, south of sawmill fork of Glen-Kelly road .....	..do.	320	17 hours
24	Vinyard-Alexander road at Blacker's house .....	..do.	355	..do.
25	Scott spring; open dipped .....	..do.	325	..do.
26	Chickamauga Creek, one-fourth mile above intake .....	..do.	575	11 days
27	Chickamauga Creek at intake	Plain bouillon....	615	17 hours
28	Cave Spring branch	1 c. c. of plain bouillon.	615	11 days
29	Well on Vinyard-Alexander road, 300 yards east of road to Hall's tower .....	..do.	335	34 hours
30	Well on Alexander road, north of Alexander's house, 250 yards .....	..do.	625	..do.
31	Well on Vinyard-Alexander road at old blacksmith shop of Walthall .....	..do.	355	17 hours
32	Well on Jay's Mill road, 100 yards north of Alexander Junction .....	..do.	370	41 hours
33	Well on Alexander's Bridge road, at Osborne's house .....	..do.	390	11 days
34	Well on the old Alexander road half way between Brotherton (county) and Jay's Mill roads .....	..do.	395	21 days
35	Well on Alexander road between the Winfrey and Osborne houses .....	..do.	350	34 hours
36	Well on Brotherton road, at junction of old Alexander (county) road .....	..do.	755	17 hours
37	Well on Brotherton road at Howell's battery; bottle lowered with string .....	..do.	420	23 hours
38	Well on Brotherton road at Bragg's Headquarters monument .....	..do.	495	30 hours
39	Well on Jay's Mill road, 200 feet south of Brotherton road .....	..do.	435	17 hours
40	Jay's Mill spring .....	..do.	345	..do.
41	Well on Reed's Bridge road at Brannan's (Peter's) house .....	..do.	545	..do.
42	Well on Jay's Mill branch, 400 yards west of Brannan's house .....	..do.	415	..do.
43	Well on Reed's Bridge road, half way between Second Minnesota monument and the road from the tower .....	..do.	340	..do.
44	Crawfish spring at Leiter Hospital, outside .....	..do.	370	..do.
45	Crawfish spring water from Leiter Hospital, faucet .....	..do.	Not noted.	23 hours

Chickamauga Park, Ga., collected September 27, 1898.

5th-day culture at 39° to 41° C.	G. pig.	Died.	Organism obtained.	Fermentation test.					Condition of water.
				Sugar.	1st day.	2d day.	4th day.	5th day.	
Gas tube, 0.3 c. c.	Grams.				<i>c. m.</i>	<i>c. m.</i>	<i>c. m.</i>	<i>c. m.</i>	
do	227		Pyocyaneus	Lactose	6.0	6.8	Max.		Clouded.
do	240	10 days	do	Saccharose	6.2	12.0	12.4		Clear.
do	240		Pyocyaneus	Glucose	5.5	7.6	Max.		Do.
do	227	17 hours	do	Lactose	.6	2.0	2.2	Max.	Do.
do	232		do	Glucose	4.2	5.3	Max.		Do.
do	240	11 days	do	Saccharose	4.6	7.5	8.0	Max.	Quite cloudy.
do	250	do	Pyocyaneus	Glucose	2.5	6.1	6.6	Max.	Do.
do	151		do	Lactose	3.0	4.8	Max.		Clear.
do	250		do	Glucose	0	0	0	0	Do.
do	275	14 hours	do	Lactose	.6	9.0	Max.		Do.
do	245		do	do	4.8	5.5	Max.		Slightly opalescent.
do	355	10 days	do	Saccharose	1.2	2.0	3.2	3.5	Clear.
do	290	22 hours	Pyocyaneus	Lactose	6.5	8.5	Max.		Do.
do	300	14 hours	do	Glucose	5.0	11.5	11.6	Max.	Very cloudy.
do	320	do	do	do	1.2	4.5	Max.		Clouded.
do	275	12 hours	do	Saccharose	0	1.5	Max.		Very cloudy.
do	270	15 hours	do	do	0	0	0	0	Opaque yellowish color.
do	310	24 hours	Pyocyaneus	Lactose	1.3	5.0	6.1	Max.	Quite clouded.
do	210	10 days	do	do	1.5	4.8	6.4	Max.	Pale brownish yellow in color.
do	645	32 hours	do	Saccharose	0	0	0	0	Clear.
do	535	17 hours	do	Glucose	2.7	8.5	9.5	Max.	Opaque dirty brownish yellow in color.
do	310		do	Saccharose	5.0	10.6			Clear.
do	415		Pyocyaneus	Glucose	4.3	Max.			Clouded dirty looking.
do	360	23 hours	do	do	4.2	9.0	10.1	Max.	Clear.
do	250	6 hours	do	Lactose	5.0	5.6	Max.		Slightly opalescent.
do	275		do	do	6.0	6.6	Max.		Clouded.
Fermentation tube, 0.3 c. c.	395	19 days	Pyocyaneus	Saccharose	6.0	9.6	Max.		Do.
do	245	10 days	do	do	3.6	7.8	Max.		Slightly cloudy.
do	235	20 days	do	do	0	2.0	2.3	2.5	Clear.
do	740		do	do	2.1	6.0	Max.		Quite cloudy.
do	313	9 days	Pyocyaneus	Lactose	0	0	0	0	Clouded.
do	550		do	Glucose	3.3	4.0	Max.		Clear.
do	565		do	do	0	0	0	0	Do.
do	610		do	do	0.6	3.0	3.4	Max.	Slightly clouded.
do	485		Pyocyaneus	do	0	0	0	0	Do.
do	515	5 days	do	Saccharose	0	0	0	0	Clear.
do	545	34 hours	do	Lactose	2.0	6.6	10.3	Max.	Quite clouded, murky.
do	300	22 hours	Pyocyaneus	Saccharose	0	0	0	0	Clear.
do	345	20 days	do	Glucose	2.4	4.6	9.0	Max.	Opaque very cloudy.
do	355		do	Lactose	3.5	10.0	11.0	Max.	Clouded rust colored.
do	305		Pyocyaneus	Glucose	3.8	6.5	Max.		Clear.
do	265		do	do	3.0	7.5	8.3	Max.	Clouded.
do			do						Opaque, dirty looking.
do			do						Clear.
do			do						Do.

Acting Asst. Surg. Charles F. Craig, in his report from the bacteriological laboratory of Sternberg Hospital, to be appended later, gives some information concerning the bacteriology of some of the waters in the park. However, as his report refers chiefly to the existence of malaria, we will give the results of his work under that head.

In order to show that many of the medical officers at Chickamauga Park realized the gravity of the situation early in the season, we give from the large list of papers in our possession the following:

HEADQUARTERS FIRST BRIGADE, THIRD DIVISION,
FIRST ARMY CORPS, CAMP GEORGE H. THOMAS,
Chickamauga, Ga., June 27, 1898.

To the ASSISTANT ADJUTANT-GENERAL,

First Brigade, Third Division, First Army Corps.

SIR: Owing to the amount of diarrheal trouble and the increase of typhoid and other fevers in this brigade, I have the honor to recommend that the command be required to use only boiled water for drinking purposes. The present directions for boiling water are not carried out. This is partly due to the want of proper utensils and facilities for storing water. I would recommend that ordinary wash boilers be obtained for boiling the water, and the proper number of barrels for storing and cooling it be procured, but that the command be required to utilize such things as they may have until the desired equipment has been obtained.

As the rear sinks are infected by the excreta of patients with typhoid fever, I would recommend that chloride of lime be obtained in large quantities for their disinfection, and that every man using the sinks be required to use earth, or a mixture of earth and lime, at once, so that at no time will excreta be exposed to the air and flies.

As this is a very important matter, I would recommend that urgent measures be taken to procure the boilers, barrels, and lime at once, without regard to the ordinary methods of business.

I remain, very respectfully,

(Signed) J. D. GLENNAN,

Major and Surgeon, U. S. Volunteers, Brigade Surgeon.

SINKS.

The difficulty that was experienced in digging sinks of proper depth has already been frequently referred to. The rocky nature of the soil in many places made it well-nigh impossible to provide sinks of proper dimensions. When rock has to be blasted in order to prepare a sink the result must always be more or less unsatisfactory. However, the difficulty in providing and caring for the sinks was not confined to their construction. The amount of dirt thrown out in the digging of these sinks was inconsiderable, and after it had lain on the surface in the sun it became almost as hard and non-porous as rock. When this dirt was thrown back into the sink it did not absorb the liquid contents, but simply displaced the watery material, and when thrown in in considerable quantities caused the sinks to overflow. There was an almost universal complaint from regimental medical officers that lime could not be obtained early in the season for the disinfection of sinks. It seems strange that no one apparently ever thought of the possibility of manufacturing enough lime to supply

the entire encampment. There is in the park practically an unlimited supply of wood, and certainly an unlimited supply of limestone rock. The construction of a few limekilns would not have been a herculean task with the large number of men on hand, and this might have supplied an abundance of lime. However, we are satisfied that if there had been no shortage in lime the condition of affairs would not have been greatly improved. The thorough disinfection of the excretions of 60,000 men when deposited in pits in the earth, and especially when scattered on the surface of the earth, is not an easy task. We may regard it as an axiom that wherever and whenever a large number of men assemble and allow their own excretions to accumulate about them there and then typhoid fever will appear and will spread. We do not mean to infer from this that typhoid fever ever originates *de novo*, nor do we mean to have anyone understand that we believe that the colon bacillus or any other germ present in the normal excretions of men can develop into the typhoid bacillus. We do mean that typhoid fever is so widely distributed that in any large assembly of men collected from different parts of the country there will be some already infected with typhoid fever. From the dejections of these the typhoid bacillus will grow and flourish in polluted places and the disease will develop and spread.

If the troops at Chickamauga had been provided with ample means for disinfecting all excretions, we do not suppose that even under these conditions typhoid fever would have been altogether unknown, but the disease might have been limited to the men who reached the camp infected, and there could have been no widespread epidemic. We are quite thoroughly convinced that some substitute must be provided for the pit system in permanent camps. While troops are on the march, stopping here and there for a day or two at most, pits for the disposition of fecal matter are sufficient, but in permanent camps they always have been, are, and probably always will be a menace to the health of any command. While it is true that it was well-nigh impossible to properly construct sinks at Chickamauga, it must not be forgotten that in other encampments where there was no difficulty in digging sinks and where there was no scarcity of earth suitable for covering their contents, typhoid fever prevailed extensively. It has been urged by some that the great prevalence of typhoid fever at Chickamauga was due to the fact that such a large number of troops were massed at one place. Relatively there is some truth in this, but at no time was the density of the soldier population of Chickamauga Park as great as that of many of our cities in which typhoid is a rare disease. It can not, therefore, be truly said that typhoid fever at Chickamauga was the result of the massing of a large number of men. At least the spread of the disease was only incidental to this. If the excretions of these men could have been

carried away by means of properly constructed sewers, or if they could have been disinfected, and if camp pollution had not been permitted and if a pure water supply had been obtained, there is no reason why typhoid fever should have been more prevalent among the troops at Chickamauga in the summer of 1898 than it was in New York City.

We repeat that, in our opinion, the sink must no longer be permitted in permanent encampments. When possible, water carriage for fecal matter may be adopted, and when this is impracticable the thorough disinfection of all fecal matter in tanks such as recommended by this board will, we believe, reduce typhoid fever in permanent encampments to a few sporadic cases.

CAMP POLLUTION.

The greatest sanitary sin committed among the troops at Chickamauga in 1898, as well as in most other national encampments, was that of camp pollution. Some of the regimental camp sites became most disgustingly filthy. It is unnecessary to repeat our evidence on this point. Reference to the regimental histories already recorded will give one some idea of the condition of some of these camps. A few extracts from our stenographic notes taken at the time of our inspection further illustrate this point: "In the camp of the Third United States Volunteer Cavalry we found the sinks full to the top with fecal matter; soiled paper was scattered about the sinks, and the woods behind the regimental camp was strewn with fecal matter. The Second Kentucky Volunteer Infantry was located in the woods; fecal matter was deposited around trees and flies swarmed over these deposits not more than 150 feet from the company mess tents; the odor in the woods just outside of the regimental lines was vile. In the Ninth New York we found three battalion sinks supposed to have been filled with straw and burned out that morning. Fecal matter was found deposited on the ground around trees and a vile odor permeated the air around the sinks."

We found in the hospital of the Third Division of the First Army Corps that the stools were not disinfected at all. The bed pans were washed in water and were not disinfected. The fecal matter of attendants was received in galvanized-iron boxes of very imperfect pattern. There was abundant opportunity for the outside of the boxes to become foul, and there was no means provided for properly handling these boxes.

These are illustrations of the condition that we found at Chickamauga. When our board visited Chickamauga, most of the regiments had already departed, and it was expected that only the Sixth United States Volunteer Infantry would remain. The following is a copy of our recommendations to General Boynton concerning the care that should be practiced by this regiment.

KNOXVILLE, TENN., *September 14, 1898.*

Brig. Gen. H. V. BOYNTON,

Camp George H. Thomas, Chickamauga Park, Ga.

GENERAL: The board of medical officers, convened by S. O. 194, par. 40, A. G. O., Washington, D. C., August 18, 1898, for the special investigation of the origin and spread of typhoid fever in the army camps, begs to submit the following recommendations concerning the Sixth United States Volunteer Infantry, the only regiment now encamped at Chickamauga Park:

1. *Water supply.*—The men of this regiment being supplied with a presumably pure water from Mullis Spring, should be compelled to use this water only and no other for any purpose whatever. Every precaution should be taken to see that patrol parties should be supplied with drinking water from this source whenever absent from camp on such duty. Suitable bath houses should be erected for the use of the men, and they should be compelled to use this water for bathing purposes. Under no circumstances should Chickamauga Creek water, or water from any other source than this spring be used. If the regiment should be ordered out for a march, water from Mullis Spring, in abundant quantity, should be carried along for drinking purposes. From an inspection of this spring and its immediate surroundings made by the board, we recommend that immediate measures be taken to protect the spring against surface drainage. The barrels used for the purpose of storing drinking water should be elevated on supports, furnished with stopcocks for withdrawing the water, supplied with tight covers and protected from the sun by a proper shelter; they should be frequently inspected and from time to time cleansed and their interiors exposed to the direct sunlight for some hours.

2. *Mess tents and kitchens.*—No measures should be omitted to prevent the access of flies to the food. The board therefore urgently recommends that both kitchens and mess tents should be promptly and thoroughly screened. All milk consumed should be boiled and thereafter protected from the flies by proper screens. As an additional precaution the cooks and attendants about the kitchens and mess tents should be compelled to thoroughly and frequently wash their hands with soap and water every time they go to the kitchen and mess tents for the performance of their duty. None but authorized persons should be permitted to handle the food supplies. Soldiers should be forbidden eating any fruit or drinking any liquid except that furnished by the regiment. Men should be compelled to thoroughly wash their hands before going to meals.

3. *Kitchen garbage.*—Suitable vessels should be provided for the reception of kitchen garbage. These should be daily removed and their contents buried or burned at some point distant from the camp. For the garbage, zinc barrels with proper covers are recommended.

4. *Company sinks.*—At the time of the inspection by the board the sinks were in foul condition; exposed fecal matter was found in every sink. The board can not too strongly emphasize the necessity of each individual being absolutely required to cover his own excrement with dry earth before leaving the sink, and this should not be left to men detailed for the purpose, as with details fecal matter is left exposed for hours to the access of flies. The sinks should be sheltered and ditched so as to prevent the access of surface water to them. If the dry-earth closets should be adopted, a box should be provided separately for each hole, and should be wide enough to receive the urine and fecal matter without danger of these being deposited outside of or on the exterior surfaces of boxes, as will happen with the boxes now in use at Sternberg Hospital, for instance. An abundance of well-dried and pulverized earth should be provided in storage, completely sheltered from the rain. This should be freely used in the boxes, each man being compelled to cover his excrement as in case of the sink. In addition to the dry earth, lime should be used at least once a day, besides always being freely placed in the boxes after emptying them. In order to insure the execution of this

measure, if necessary a sentinel should be placed at each sink, or closet, with positive instructions for their enforcement.

5. *Tents*.—All tents should have a flooring raised at least 6 inches above the ground, and if practicable the soldiers should be provided with cots. All bedding and blankets should be daily exposed to the direct sunlight. Men should be compelled to remove their outer clothing at night. The floors of all the tents should be kept clean.

6. *Regimental hospital*.—All men with fever should be immediately removed to the hospital. The most thorough disinfection of the stools and urine of all patients under treatment in the hospital and of all bedclothing and personal linen should be required as a matter of routine. This recommendation should apply not only to all fever patients but also to all others. For the purposes of disinfection a solution consisting of 1 part of carbolic acid to 30 parts of water should be prepared in large quantities and stored in barrels, readily accessible as the sole disinfectant. A pint of this should be placed in each bedpan before it receives the discharge from the patient. When the bedpan is removed an additional pint of the solution should be added, and the vessel carried to the sink, emptied, and afterwards thoroughly washed with the same disinfecting solution. After each stool the patient's buttocks should be carefully cleansed with this solution. Whenever any fecal matter is spilled upon the floors or grounds the spot should be immediately cleaned and disinfected with this solution. All soiled personal and bed linen should be immediately removed and at once immersed in the same carbolic solution for at least two hours. Mattresses, bed linen, and the blankets should be daily exposed to the direct sunlight when not in use. All hospital tent floors should be scrubbed daily with this solution. The greatest attention should be paid to the disinfection and condition of the hospital sink in addition to the thorough disinfection of all stools. Lime and dry earth should be thrown into the sinks. The possibilities of flies gaining access to any fecal matter in the sinks should be absolutely prevented by this means. Attendants should be required to disinfect their hands after attending each patient in each instance. The recommendations made with reference to the company mess tents and kitchens apply with special force to the hospital mess tents and kitchens.

The foregoing apparently minute details concerning water supply, mess tents and kitchens, garbage, company sinks, tentage, and hospital, must be carried out in every particular if typhoid fever, already present in this command, is to be stamped out. We therefore recommend that each one of these sanitary regulations be placed upon the status of military discipline, and that an infraction of any of them be as severely punished as any other breach of discipline. In no other way can immunity be secured to this regiment of "immunes."

Very respectfully,

(Signed) WALTER REED,
Major and Surgeon, U. S. Army.

VICTOR C. VAUGHAN,
Major and Division Surgeon, U. S. Volunteers.

E. O. SHAKESPEARE,
Major and Brigade Surgeon, U. S. Volunteers.

Subsequently we recommended that the galvanized-iron boxes prepared by our board and adopted by the Surgeon-General should be used in place of sinks.

After inspecting the Second Division of the First Army Corps at Knoxville, the board made the following report:

KNOXVILLE, TENN., September 16, 1898.

To the ADJUTANT-GENERAL,

SECOND DIVISION, FIRST ARMY CORPS,

Camp Poland, Knoxville, Tenn.

SIR: The board of medical officers convened per Special Orders, 194, paragraph 40, Adjutant-General's Office, Washington, D. C., August 18, 1898, respectfully submit the following recommendation in compliance with the provisions of said order:

1. *Water supply*.—As far as the board has been able to judge the water supply appears to be of good quality. The supply of the city of Knoxville proper has been used by the Fourth Tennessee Volunteer Infantry for more than two months, and although there are a few cases of typhoid fever in this regiment, these are plainly not due to water contamination. The supply of West Knoxville is presumably of good quality.

2. (a) *Kitchen sinks*.—All garbage should be received into water-tight barrels and carried away from the camps daily; wash water should be thrown into pits in which dry earth and ashes are daily used for covering. As a rule, kitchen sinks have been found in good sanitary condition. The best cared for kitchen sinks are those of the First West Virginia and Sixth Ohio; the worst those of the Thirty-first Michigan, Second Ohio, First Pennsylvania, and Fourteenth Minnesota. Earth should be placed in the sinks whenever fluid garbage is emptied into them. There is needed frequent inspection of these sinks by company and medical officers to insure a good sanitary condition.

(b) *Company sinks*.—With the presence of typhoid fever among the men of every regiment constituting this division, except the Sixth Virginia Infantry (a recently recruited regiment), the board must express considerable surprise that so little attention is given to the condition of these sinks; not one was found to be properly cared for; exposed fecal matter, with attendant flies, was found in every sink. The sinks of the Sixth Ohio were in the best condition, the remainder were all foul and offensive. This condition, a constant menace to health, should not be tolerated any longer. Every soldier in this command should be compelled to cover with dry earth his excrement as soon as deposited. In no other way can sinks be kept in a safe and sanitary condition. If necessary to enforce this order sentinels should be placed near each sink to see that men cover at once their excrement. The proposal to keep sinks dark is not considered advisable. Light should be admitted, so that the sink can be inspected at all times. Once each day lime should be freely used to cover the margins, sides, and bottoms of all sinks. In the opinion of the board no sanitary measure is so important for the health of this command as such care of sinks as has been recommended above. At the inspection made this day of the camp site of the Sixth Virginia and Third North Carolina Infantry it was found that the men of both of these regiments were using the abandoned sinks of the First Pennsylvania Regiment. These sinks were found to be in an indescribably filthy condition, disgraceful to any command; not even a shovelful of earth had been placed in any sink. If such condition of the sinks of this command is to be permitted, then all efforts to stamp out typhoid fever will be of no avail. Already typhoid fever has appeared among the men of one of these regiments (Third North Carolina).

We visited the camp of the Fourth Tennessee with considerable interest, as we had understood that this regiment had so far escaped typhoid fever. However, we found they had already had one death from this disease, and there are now two cases of typhoid fever in their regimental hospital. This command has a regimental sink to which no attention is given, and its condition is such as to practically guarantee the distribution of typhoid fever

throughout the regiment. We learn that this regiment intends to adopt the "tub" system of disposing of fecal matter. If there be any form of disposition of fecal matter more dangerous to the soldier than the unkept sink, it is the tub. We have seen abundant evidence of this in the Seventh Army Corps. The tub is a portable privy, often laden with typhoid infection, which is scattered from the privy to the place where the matter is deposited. We beg to protest most earnestly against the tub system. We suggest that battalion sinks be properly constructed and properly cared for in this regiment. If this be done, there is the possibility of stamping out the disease. We feel quite certain that the medical officer of this regiment will fail to recognize typhoid fever in its early stage; we therefore recommend that the sanitary inspector visit this regiment at least twice each week, and that he not only inspect the sinks, but also examine the patients in the regimental hospital and in quarters, and, should new cases appear, this regiment should be immediately moved to another site. This suggestion that the sanitary inspector look after regimental hospitals should apply to all regiments having such hospitals. He should see that the stools of all patients in these hospitals are properly disinfected. Unless constant attention be given to the care of sinks and the disinfection of stools the experience at Chickamauga will be repeated at Knoxville.

3. *The division hospital.*—The board made an inspection of this hospital on the 14th instant. The number of patients on this date was about 235. The wards were found to be overcrowded, as many as seven or eight patients being in each tent. The floors of the general pavilion, as well as of the tents, were in a filthy condition. As far as the board was able to judge by inspection and by questioning the nurses, no attention was paid to the disinfection of either stools or personal or bed linen. Patients with garments soiled with typhoid discharges were found in one of the wards. Bed pans used for the patients were soiled with discharges not disinfected. Open vessels containing the nondisinfected discharges of typhoid patients were being carried from the wards to the sink, there emptied without disinfection, and the contents allowed to drop upon the surrounding ground. The sink intended for the reception of typhoid discharges was very offensive. The margins and sides of the sink were in like condition. It was evident upon inspection that the surgeon in charge had no appreciation of the need of disinfection of stools or linen or of the need of cleanliness in the hospital. The board found the number of nurses to be insufficient. In the opinion of the board no time should be lost in securing the services of trained female nurses for this hospital, in order to enable proper care and attention to be given to the sick.

The most thorough disinfection of all stools and urine of all patients under treatment in the hospital and of all bed clothing and personal linen should be required as a matter of routine. This recommendation should apply not only to all fever patients, but also to all others. For the purposes of disinfection, a solution consisting of one part of carbolic acid to thirty parts of water should be prepared in large quantities and stored in barrels readily accessible as the sole disinfectant. A pint of this should be placed in each bed pan before it receives the discharge from the patient; when the bed pan is removed an additional pint of the solution should be added and the vessel carried to the sink, emptied, and afterwards thoroughly washed with the same disinfectant solution. After each stool the patient's buttocks should be carefully cleansed with the same disinfectant solution. Whenever any fecal matter is spilled upon the floors or ground the spot should be immediately cleaned and disinfected with this solution. All soiled personal and bed linen should be immediately removed and at once immersed in the same carbolic solution for at least two hours. Mattresses, bed linen, and the blankets should be daily exposed to the direct sunlight when not in use. All hospital tent floors should be scrubbed daily with this solution. The greatest attention should be paid to the disinfection and condition of the hospital sink; in addition to the thorough disinfection of all stools, lime and dry

earth should be thrown into the sinks. The possibility of flies gaining access to any fecal matter in the sinks should be absolutely prevented by this means. Attendants should be required to disinfect their hands after attending each patient in each instance.

The board especially recommends as an important sanitary measure that men with fever should be immediately removed from their regimental quarters or regimental hospital to the division hospital. Under no circumstances should the men with fever be permitted to occupy the tents with their comrades.

4. *Camp sites.*—Since it is true that every regiment in this division has been and is infected with typhoid fever, it follows that the ground upon which each and every regiment has been or is located is also infected. We therefore deem it very unwise to encamp a regiment upon sites vacated by those leaving. The tent floors left by the First Pennsylvania are now being used by the Sixth Virginia; this should not be done until these floors have been washed with a 5 per cent solution of carbolic acid and afterwards exposed to the direct rays of the sun for at least two days.

The foregoing recommendations are respectfully submitted.

(Signed)

WALTER REED,

Major and Surgeon, U. S. Army.

VICTOR C. VAUGHAN,

Major and Division Surgeon, U. S. Volunteers.

In extenuation of the condition of the camps at Chickamauga, it has been stated that all of the regiments there were on waiting orders and expected every day that they would start the next for Cuba or Porto Rico. This is true, but it should not be offered in extenuation of the condition of the camps. Every camp, even when it is to be occupied for only a day, should be policed as thoroughly as if the commanding officer knew that he was to remain there for weeks.

SHELTER, OCCUPANCY, AND ARRANGEMENT OF CAMPS.

On this point we will copy verbatim from the report of Major Woodhull, who inspected the troops at Chickamauga in August:

All the troops are under canvas and nearly all the canvas is overcrowded. The tents are of many patterns—a few shelter, more conical, and conical wall; some State tents of various sizes, the most of which are so-called "flood" tents of the Mississippi Valley, very old and nearly all leaky, and the greater part the improved common or A wall tent. The occupants vary from two in the shelter to four and five in the A, six or eight in the "flood," and fifteen or sixteen in the conical.

Many of the regimental sites are precisely the same as those occupied from the beginning. A few of the regiments have been moved, and it is probable that more are now being changed, but at the time of my observation many of the commands had been in absolutely the same position for two months or more. Not only were the camp sites the same, but in the most instances the tents themselves stood where they had first been placed. In scarcely any instance was fresh ground available, as it should be, upon which the tents might be moved laterally every week or ten days. Consequently the ground itself is being poisoned imperceptibly, but persistently, by the human body, without the disinfectant and redeeming action of direct sunlight upon it. The contents of the tents, such as blankets, straw, and the like, have been irregularly removed into the open air, but, as a rule, not often enough. Direct touch showed in many instances that these articles and the ground were damp. The camps, speaking generally, were crowded not merely as to inhabitants, but as to the neighborhood. There was abundant room between divisions and generally between brigades, but many of the brigade camps were too compressed, and with some of the regiments the compression was extreme and in

defiance of all sanitary laws; this in addition to the tents themselves having too many occupants. The difficulty probably arose originally from the expectation that many more troops would be sent into the park, for whom space must be reserved. In some cases higher authority arbitrarily established the regimental lines. Whatever the reason, the effect is clear—the tents are overcrowded and without sufficient adjoining space, the streets are narrow, and the soil is becoming more and more charged with filth. Owing to reasons previously explained, company sinks were made with difficulty and were multiplied on account of their shallowness and the rapidity with which they filled with water. They thus encroached more and more upon the open space and intruded toward the camps. For instance, in the Second Arkansas, Second Brigade, Second Division, Third Army Corps, the men's sinks were within 30 yards of the kitchens, and were very offensive. The kitchen sinks were intermediate and so full and so foul that maggots were abundant on the surface. In the Fifth Pennsylvania the camp site was lower than the sinks, and during recent rains they overflowed and flooded the camp. The sick report of the regiment was 11 per cent, including 25 cases recognized as typhoid and 15 supposed to be of that disease, with the sick rate increasing.

More than half of the men slept on the ground. In some regiments the tents were floored, in others cots and field bedsteads were arranged, but always at private or regimental expense. The motive in many instances doubtless was comfort, but in one regiment (Third Tennessee) the men bought the cots, because they had learned by experience in civil life that it was harmful to sleep on the ground in that climate. In a very sickly regiment (Ninth Pennsylvania) the medical officer pointed out a very high three-story bunk whose tenants he declared the healthiest in the command. A group of three is too small to reason from, but it is significant that among much sickness these men escaped. The sanitary advantage of being off the ground is freedom from dampness and especially escape from the immediate influence of the ground air which, under the conditions described, must be peculiarly deleterious. It is recommended that in all camps of position in southern climates the tents be floored, with a considerable space beneath, and that the floors be portable, so that they may be moved (within the camp) when necessary for change of site or for police. The expenditure for a few feet of lumber when the regiment departs is well balanced by the greater physical efficiency of the men.

Quite independently of any specific contamination of the water supply (and were the general water supply thus contaminated the typhoid fever would also be general, which it is not as yet) the pollution of the soil by fecal discharges, specifically diseased or healthful, leads to the occurrence of diarrhea, to general physical depression, moderate fever, and undermining the man's health; and whether an imported case or not is necessary to fire the train, it is the universal experience of armies that outbreaks of typhoid fever will occur under just such circumstances. This is perfectly understood and always anticipated by sanitarians where precautionary measures are not carried into effect. In this case, besides having a congenial soil fertilized day by day for such seed, the seed itself was introduced directly by various regiments, as the Thirty-first Michigan, First South Carolina (as reported, regiment has left the park), Fifty-second Iowa, which brought no acute case, but was infected before arrival, and Ninth Pennsylvania, which has had nearly one hundred cases in all. Besides which, certain regiments (Fourteenth Minnesota, Second Ohio, Third United States Volunteer Cavalry) have treated cases for considerable periods in the camps themselves. It can not be necessary to enlarge on the facilities for the spread of this disease that are afforded by fatigue, heat, moisture, overcrowding, dust, and flies; and all these are present.

The following figures give the most important facts concerning typhoid fever in the First and Third Army Corps:

FIRST ARMY CORPS.

FIRST DIVISION.

Brigade and regiment.	Strength.	Total number of probable cases.	Percentage of troops with typhoid fever.	Number of recognized cases.	Total deaths.	Deaths from typhoid.	Percentage of deaths among probable cases.	Percentage of deaths among recognized cases.
<i>First Brigade.</i>								
First Kentucky ^a	1,318	262	19.87	88	28	18	6.87	20.45
Third Wisconsin ^a	1,313	378	28.78	107	36	25	6.61	23.36
Fifth Illinois	1,296	125	9.64	113	16	8	6.40	7.08
<i>Second Brigade.</i>								
Fourth Ohio ^a	1,313	.....	.....	.....	26	19	.....	.....
Third Illinois ^a	1,321	546	41.33	149	44	25	4.57	16.77
Fourth Pennsylvania ^a	1,294	.....	.....	.....	35	24	.....	.....
<i>Third Brigade.</i>								
Sixteenth Pennsylvania ^a	865	.....	.....	.....	41	34	.....	.....
Second Wisconsin ^a	1,326	329	24.81	113	41	27	8.20	23.89
Third Kentucky	1,293	219	16.93	.....	17	11	5.02	.....

^a These regiments went to Porto Rico.

SECOND DIVISION.

<i>First Brigade.</i>								
Thirty-first Michigan	1,290	239	18.53	86	27	16	6.69	18.60
One hundred and sixtieth Indiana	1,312	223	16.99	47	11	8	3.58	17.02
First Georgia	1,212	120	9.90	36	10	9	7.50	25.00
<i>Second Brigade.</i>								
One hundred and fifty-eighth Indiana	1,288	128	9.93	49	12	10	7.81	20.40
Sixth Ohio	1,299	291	22.40	148	21	19	6.52	12.83
First West Virginia	1,298	260	20.03	106	15	12	4.61	11.32
<i>Third Brigade.</i>								
First Pennsylvania	1,071	222	20.72	169	14	12	5.40	7.10
Fourteenth Minnesota	1,277	286	22.39	146	13	12	4.19	8.21
Second Ohio	1,297	403	31.07	192	14	13	3.22	6.77

THIRD DIVISION.

<i>First Brigade.</i>								
Fifth Pennsylvania	1,291	338	26.18	152	16	16	4.73	10.52
Twelfth Minnesota	1,299	433	33.33	144	19	19	4.38	13.19
First South Carolina	1,163	.....	.....	.....	20	10	.....	.....
<i>Second Brigade.</i>								
Eighth Massachusetts	1,317	272	20.65	157	30	19	6.98	12.10
Twenty-first Kansas	1,264	294	23.25	95	23	21	7.14	22.10
Twelfth New York	1,302	490	37.63	144	21	20	4.08	13.89
<i>Third Brigade.</i>								
Second Missouri	1,269	268	21.11	181	20	19	7.09	10.49
First New Hampshire	1,296	297	22.91	213	32	30	10.10	14.08
Ninth Pennsylvania	1,291	334	25.87	155	27	25	7.48	16.12

THIRD ARMY CORPS.

FIRST DIVISION.

<i>First Brigade.</i>								
Fourteenth New York	1,277	233	18.24	95	31	24	10.30	25.26
First Missouri	1,275	216	16.94	46	14	11	5.09	23.91
Fifth Maryland	985	250	25.38	147	18	17	6.80	11.56
<i>Second Brigade.</i>								
Second Nebraska	1,303	167	12.81	56	26	22	13.17	39.28
Second New York	1,014	161	15.87	46	31	30	18.63	65.21
First District of Columbia	942	.....	.....	.....	25	14	.....	.....
<i>Third Brigade.</i>								
Third Tennessee	1,293	123	9.51	61	19	12	9.75	19.67
First Vermont	996	278	27.91	84	26	22	7.91	26.19
Eighth New York	1,301	425	32.66	190	23	22	5.17	11.58

THIRD ARMY CORPS—Continued.

SECOND DIVISION.

Brigade and regiment.	Strength.	Total number of probable cases.	Percentage of troops with typhoid fever.	Number of recognized cases.	Total deaths.	Deaths from typhoid.	Percentage of deaths among probable cases.	Percentage of deaths among recognized cases.
<i>First Brigade.</i>								
Second Kentucky	1,332	286	21.47	87	30	28	9.79	32.18
Ninth New York	1,292	323	25.00	139	46	46	14.24	33.09
First Arkansas	1,290	228	17.67	83	23	19	8.33	22.89
<i>Second Brigade.</i>								
Fifth Missouri	1,274	212	16.64	51	16	14	6.60	27.45
Second Arkansas	1,291	287	22.23	95	26	17	5.92	17.89
Sixty-ninth New York	1,026	299	29.14	191	25	23	7.69	12.04
<i>Third Brigade.</i>								
First Maine	1,286	188	14.61	88	45	45	23.93	51.13
Fifty-second Iowa	1,304	345	26.45	184	37	36	10.43	19.56
First Mississippi	1,029	397	38.58	98	33	29	7.30	29.59

CAVALRY BRIGADE.

Third United States Volunteer Cavalry	1,013	270	26.65	103	15	13	4.81	12.62
First Illinois Volunteer Cavalry	1,299	220	16.93	68	17	16	7.27	23.58
First Ohio Volunteer Cavalry	833	189	22.68	189	7	7	3.70	3.70

LIGHT ARTILLERY BRIGADE.

Light Artillery Brigade	1,893				21	17		
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SIXTH UNITED STATES VOLUNTEER INFANTRY.

Sixth United States Volunteer Infantry		133		121	6	5	3.75	4.13
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In the above tables the figures showing the strength of each regiment are not absolutely correct. In most cases the figures are those that indicate the strength of the regiment when it left Chickamauga. For the purposes for which these tables are compiled, it would be better if we could give the total number of individuals connected with each regiment, but figures showing this fact are not at our command.

In coming to conclusions concerning typhoid fever among the troops of these corps, it will be necessary to leave out of consideration the seven regiments of the First Division of the First Army Corps that went to Porto Rico, because, as has already been stated, undoubtedly a considerable proportion of the cases of protracted fever in these regiments were malarial, and from the data at our command we have been unable with any certainty to distinguish the malarial from the typhoid fevers in the cases originating in Porto Rico.

There were only two regiments (Fifth Illinois and Third Kentucky) of the First Division of the First Army Corps that did not go to Porto Rico.

These two regiments had a combined strength of 2,589.

Total number of cases of probable typhoid fever in these two regiments.....	344
Percentage of probable typhoid fever among the troops of these two regiments.....	13.28

Total number of deaths from typhoid fever in these two regiments.....	19
Percentage of deaths among cases of probable typhoid fever in these two regiments.....	5.52

We can not give the total number of cases of recognized typhoid fever in these two regiments on account of having no data on this point for the Third Kentucky.

Aggregate strength of the Second Division of the First Army Corps.....	11,344
Total number of cases of probable typhoid fever in the Second Division of the First Army Corps.....	2,172
Percentage of probable typhoid fever among the troops of the Second Division of the First Army Corps.....	19.14
Total number of deaths from typhoid fever in the Second Division of the First Army Corps.....	111
Percentage of deaths among probable cases of typhoid fever in the Second Division of the First Army Corps.....	5.11
Total number of cases of recognized typhoid fever in the Second Division of the First Army Corps.....	979
Percentage of deaths among recognized cases of typhoid fever in the Second Division of the First Army Corps....	11.34

In studying the Third Division of the First Army Corps, it will be necessary to omit the First South Carolina, which remained at Chickamauga only a few days.

Aggregate strength of the eight regiments of the Third Division of the First Army Corps.....	10,329
Number of cases of probable typhoid fever in the eight regiments of the Third Division of the First Army Corps.....	2,726
Percentage of probable typhoid fever among the troops of the eight regiments of the Third Division of the First Army Corps	26.39
Total number of deaths from typhoid fever in the eight regiments of the Third Division of the First Army Corps ...	169
Percentage of deaths among probable cases of typhoid fever in the eight regiments of the Third Division of the First Army Corps.....	6.20
Total number of cases of recognized typhoid fever in the eight regiments of the Third Division of the First Army Corps.....	1,241
Percentage of deaths among recognized cases of typhoid fever in the eight regiments of the Third Division of the First Army Corps	13.62

In studying the First Division of the Third Army Corps, it will be necessary to omit the First District of Columbia Volunteers, because this command remained at Chickamauga only a few days.

Aggregate strength of the eight regiments of the First Division of the Third Army Corps.....	9,444
Total number of cases of probable typhoid fever in the eight regiments of the First Division of the Third Army Corps.....	1,853
Percentage of probable typhoid fever among the troops of the eight regiments of the First Division of the Third Army Corps	19.62
Total number of deaths from typhoid fever in the eight regiments of the First Division of the Third Army Corps.....	160
Percentage of deaths among probable cases of typhoid fever in the eight regiments of the First Division of the Third Army Corps	8.63
Total number of cases of recognized typhoid fever in the eight regiments of the First Division of the Third Army Corps.....	725
Percentage of deaths among recognized cases of typhoid fever in the eight regiments of the First Division of the Third Army Corps	22.06

Aggregate strength of the nine regiments of the Second Division of the Third Army Corps.....	11,124
Total number of cases of probable typhoid fever in the nine regiments of the Second Division of the Third Army Corps.....	2,565
Percentage of probable typhoid fever among the troops of the nine regiments of the Second Division of the Third Army Corps	23.05
Total number of deaths from typhoid fever in the nine regiments of the Second Division of the Third Army Corps.....	257
Percentage of deaths among probable cases of typhoid fever in the nine regiments of the Second Division of the Third Army Corps	10.01
Total number of cases of recognized typhoid fever in the nine regiments of the Second Division of the Third Army Corps	1,016
Percentage of deaths among recognized cases of typhoid fever in the nine regiments of the Second Division of the Third Army Corps	25.29

The aggregate strength of the First and Third Army Corps, excluding the regiments that went to Porto Rico from the First Division of the First Army Corps, the First South Carolina from the Third Division of the First Army Corps, and the First District of Columbia Volunteers from the First Division of the Third Army Corps, was 44,830.

Total number of cases of probable typhoid fever among these troops.....	9,660
Percentage of probable typhoid fever among these troops..	21.54
Total number of deaths from typhoid fever among these troops	716
Percentage of deaths among probable cases of typhoid fever among these troops.....	7.41
Total number of cases of recognized typhoid fever among these troops.....	4,125
Percentage of deaths among recognized cases of typhoid fever among these troops.....	17.35

If to the above figures we add those of the Cavalry Brigade, we have the following:

Total number of troops in the First and Third Army Corps for which statistics concerning typhoid fever have been collected.....	47,975
Total number of cases of probable typhoid fever among these troops.....	10,339
Percentage of probable typhoid fever among these troops..	21.55
Total number of deaths from typhoid fever among these troops	752
Percentage of deaths among probable cases of typhoid fever among these troops.....	7.27
Total number of cases of recognized typhoid fever among these troops.....	4,373
Percentage of deaths among recognized cases of typhoid fever among these troops.....	17.19

We are without sufficient data to enable us to add to these figures those from the Light Artillery Brigade and from the Sixth United States Volunteer Infantry.

We have used one statement in all of these compilations which, without proper explanation, may be misunderstood. We have given the percentage of deaths among recognized cases of typhoid fever. We have

already called attention to the fact that the statement of this percentage is not altogether correct, because all the deaths from typhoid fever did not occur among recognized cases of typhoid fever. It may be of interest to inquire how the regimental and hospital surgeons diagnosed the cases which terminated fatally from typhoid fever. The 716 deaths given in the above figures as total deaths from typhoid fever in the First and Third Army Corps, excluding the regiments that went to Porto Rico from the First Division of the First Army Corps, the First South Carolina from the Third Division of the First Army Corps, the First District of Columbia Volunteers from the First Division of the Third Army Corps, and the cavalry brigade of the First Army Corps, were not all diagnosed typhoid fever by army medical officers. By looking over the list of deaths given in each regiment one easily sees that a considerable number of these deaths occurred after the patients had reached their homes on furlough. Most of these men sent home on furlough are recorded in the regimental and hospital reports as having malaria, or they were sent home without any definite diagnosis. Taking the 716 cases referred to, the recorded diagnoses of these cases were as follows:

Typhoid fever.....	391
Malaria.....	146
Undiagnosed, or undetermined fever	141
Diarrhea.....	22
Dysentery	9
Indigestion	4
Gastritis.....	1
Enteritis.....	1
Pneumonia	1
Total	716

In other words, in 4,125 cases of recognized typhoid fever among these troops 391 died. After studying the records we have added 5,535 cases which we believe to have been typhoid fever. Among the 4,125 cases of recognized typhoid fever there were 391 deaths; among the 5,535 cases which we have added there occurred 325 deaths from typhoid fever.

Percentage of deaths among the 4,125 cases of recognized typhoid fever	9.47
Percentage of deaths from typhoid fever among the 5,535 cases of probable typhoid fever.....	5.87

This, we think, is the strongest proof that we can offer that the cases which we have classed as probable typhoid fever are properly classified. The death rate among these from typhoid fever is the death rate of typhoid fever. As has already been stated, most of these men were allowed to go home on furlough. They were granted furlough on the diagnosis of some other disease than typhoid fever. They went to their homes, and 323 out of the 5,367 cases died from a disease recognized by the physician who attended them in their last illness as typhoid fever. We think that these fig-

ures establish beyond any doubt our claim that the number of cases of typhoid fever among the troops in the First and Third Army Corps was more than twice the number recognized as having that disease.

Out of the 716 deaths from typhoid, 352 occurred in some army hospital, 317 occurred elsewhere, principally at the homes of the men, and in 47 cases we have not been able to ascertain the place of death. Parenthetically it might be remarked that these figures show that the general order permitting medical officers to send home sick men on furlough was not abused. The number of malingerers must have been very small. This was the opinion of the army medical officers at Chickamauga at the time. Frequently the statement was made that it was difficult to induce the men to accept furloughs until they became too sick to travel. All those who saw the sick returning from Chickamauga and other camps during the summer of 1898 must have been convinced by the appearance of these furloughed soldiers that they were in reality sick. The figures which we have just given confirm this impression with mathematical exactness.

We have several times spoken of the death rate of typhoid fever. It may be well to endeavor to ascertain what the death rate of this disease is. It is well known that ever since typhoid fever has been recognized as a distinct disease and has been distinguished from typhus fever the death rate from this disease has gradually decreased. This decrease in the death rate is undoubtedly due to two causes. In the first place, the diagnosis of the disease is much more easy than it was formerly when typhus fever was so prevalent; in the second place, the methods of treatment of typhoid fever have greatly improved. Murchison reported 2,505 cases that occurred in the London Fever Hospital from 1848 to 1862, with a death rate of 18.5 per cent; Griesinger collected 18,612 cases from the hospitals of London, Glasgow, Paris, and Strasburg from 1840 to 1865, and found a death rate of 18.52 per cent. In the Old Hospital in Vienna from 1846 to 1861 there were 21,189 cases of typhoid fever, with a death rate of 22.2 per cent; in the Jacobs Hospital, in Leipzig, from 1880 to 1893 there were 1,626 cases, with a death rate of 12.7 per cent; in the city of Hamburg during the years 1886 and 1887 there were 10,823 cases, with a death rate of 8.5 per cent. These cases were divided by years as follows: In 1886, 3,948 cases, with a death rate of 9.2 per cent; in the year 1887, 6,875 cases, with a death rate of 6.9 per cent. In 1897 there were 1,885 cases at Maidstone, England, with a death rate of 7.5 per cent. Brand has collected 19,017 cases treated by cold baths, with a mortality of 7.8 per cent.

All the above-given figures have been obtained from European sources and refer, many of them, to epidemics more or less remote in time. We have been anxious to ascertain the mortality from typhoid fever in this country and at this time. In order to get information on this subject we have addressed a request to the superintendents of several of the largest hospitals in the United States, asking for the number of cases of typhoid fever treated in the years 1896 and 1897, and the number of deaths in each of these years. We have not asked for cases in 1898, because we wished to avoid cases among soldiers. The following figures have been obtained in response to this request:

Death rate from typhoid fever in some of the larger hospitals in the United States.

Name of hospital.	Number of cases.		Deaths.		Total cases in 1896 and 1897.	Total deaths in 1896 and 1897.	Percentage of deaths.
	1896.	1897.	1896.	1897.			
City Hospital, Boston, Mass.....	437	399	44	46	836	90	10.76
Massachusetts General Hospital, Boston, Mass.....	151	100	16	8	251	24	9.56
Episcopal Hospital, Philadelphia, Pa.....	153	141	13	10	294	23	7.82
University Hospital, Philadelphia, Pa.....	20	36	1	3	56	4	7.14
German Hospital, Philadelphia, Pa.....	64	153	7	10	217	17	7.83
Johns Hopkins Hospital, Baltimore, Md.....	110	116	11	3	226	14	6.19
St. Luke's Hospital, New York, N. Y.....	32	34	1	0	66	1	1.51
Bellevue Hospital, New York, N. Y.....	72	76	11	11	148	22	14.86
Mount Sinai Hospital, New York, N. Y.....	105	94	8	9	199	17	8.54

Total number of cases of typhoid fever in these hospitals..... 2,293
 Total number of deaths among the cases treated in these hospitals..... 212
 Percentage of deaths among these cases..... 9.24

It will be seen from these figures that the average death rate from typhoid fever in the large hospitals is a little more than 9 per cent. Bearing in mind that only graver cases are carried to hospitals and that the cases treated in hospitals embrace all ages and conditions of life, while the soldiers were men selected on account of physical perfection, it must be admitted that a death rate of 7.27 per cent among the 10,339 probable cases of typhoid fever in the First and Third Army Corps was not an unusually low one.

We have endeavored to ascertain the death rate from typhoid fever in general practice in some of the largest cities in the Union. With this in view, we directed a letter to the health commissioner of each of these cities. Most of these officials reply that they are unable to give anything more than the number of deaths, inasmuch as cases of typhoid fever are not reported to the health authorities. From a few cities returns have been furnished us. In our opinion, these are wholly worthless so far as information concerning the death rate from typhoid fever is concerned. They are, however, of

interest for another reason, and we will give some of them:

Death rate from typhoid fever in certain cities in the United States.^a

City.	Year.	Number of cases.	Number of deaths.	Percentage of deaths.
Buffalo, N. Y.....	1894	1,088	185	17.00
	1895	397	98	24.68
	1896	274	68	24.81
	1897	201	63	31.34
	1898	280	98	35.00
Albany, N. Y.....	1896	438	97	22.14
	1897	440	84	19.09
	1896	435	60	13.79
Minneapolis, Minn.....	1897	1,534	148	9.64
	1896	1,216	175	14.39
	1897	1,284	184	14.33
Pittsburg, Pa.....	1896	296	142	47.97
	1897	256	73	28.51
	1896	51	9	17.64
Richmond, Va.....	1897	78	7	8.97
	1896	785	102	12.99
	1897	357	33	9.24
Duluth, Minn.....	1896	348	106	30.45
	1897	433	124	28.63
St. Louis, Mo.....	1896	2,490	402	16.14
	1897	2,994	401	13.38

^aToo late for insertion in this table, we have received the following figures concerning typhoid fever in New York City:

Number of cases of typhoid fever treated in New York City during the year 1896.....	1,004
Number of cases treated during the year 1897.....	1,004
Number of deaths among those treated in 1896.....	297
Number of deaths among those treated in 1897.....	299
Percentage of deaths among those treated in 1896.....	29.64
Percentage of deaths among those treated in 1897.....	29.78
Total cases treated in New York City in 1896 and 1897.....	2,008
Total deaths among those treated in 1896 and 1897.....	596
Percentage of deaths among those treated in 1896 and 1897.....	29.71

Dr. Roger S. Tracy, register of records, sends the following statement with these figures:

"The 'cases treated,' as given above, are the cases reported to the department of health. It is not probable that all cases are reported, and there is no way of estimating the number that may go unreported. Of course all the deaths are included, excepting the possible few cases that may be unrecognized and go upon the record under other names."

It will be seen from these figures that the physicians of New York City fail to recognize typhoid fever to a greater extent than did the army surgeons at Chickamauga.

Total number of cases of typhoid fever reported in the above-mentioned cities in 1896 and 1897.....	15,675
Total number of deaths among the cases reported in the above-mentioned cities in 1896 and 1897.....	2,659
Percentage of deaths among reported cases in the above-mentioned cities.....	16.96

What information have we gained from these figures? Are we to infer from them that the death rate from typhoid fever in general practice in our large cities is 16.96 per cent, while in our hospitals, to which, as a rule, the graver cases are sent, it is only 9.24 per cent, and while in the city of Hamburg it is only 8.5 per cent? In our opinion, such inferences are not warranted. We are forced to conclude that in those cities in which the health regulations require physicians to report all cases of typhoid fever a large per cent of the cases of this disease are not recognized as typhoid fever. The army surgeon has been severely criticised for not recognizing typhoid fever. What can be said of the average physician in general practice in our country? We must call attention to the similarity in two sets of figures. Referring back to our percentage records concerning deaths from typhoid fever in the First and Third Army Corps, it will be seen that the percentage of deaths among recognized cases of typhoid fever was 17.35; now we have found that in the above-mentioned

cities the death rate among recognized cases of typhoid fever is 16.96 per cent. In other words, the army surgeon did in his military service just as he was in the habit of doing in his civil practice; that is, he failed to properly diagnose the milder cases of typhoid fever. His military record on this point is no worse and no better than was his own record in civil practice, or is the record of physicians in some of the largest cities in the United States.

MALARIAL DISEASES IN THE FIRST AND THIRD ARMY CORPS.

As has already been stated, all kinds of illnesses were diagnosed malaria at Chickamauga. We find the most trivial cases, as well as the most serious ones, recorded as malaria. The medical officers apparently went into the Southern camps believing that they would meet with this disease most frequently, and if we accept their recorded diagnoses their expectations were certainly fully realized. It will be interesting for us to make an inquiry concerning the actual prevalence of malaria among these troops. In the first place, it is worthy of note that in the regimental records themselves there is evidence that malaria was not a prevalent disease at Chickamauga Park. This evidence is furnished by such illustrations as the following: The Second Brigade of the Second Division of the First Army Corps consisted of the One hundred and fifty-eighth Indiana, the Sixth Ohio, and the First West Virginia. These regiments were encamped side by side. From the regimental sick reports it appears that malaria prevailed in the Indiana regiment from May throughout the summer. There were no cases in the Ohio regiment in May, 3 in June, 11 in July, 103 in August, and 203 in September. In the First West Virginia Regiment the diagnosis of malaria does not appear on the regimental records until August, when 108 cases are reported. That there should have been malaria in the Indiana regiment in May and not a case in either of the other regiments in the same brigade is not probable; and that it could have required two months for this disease, had Chickamauga been the fearfully malarious place it is said by some to be, progressing slowly through the Ohio regiment, to reach the West Virginia regiment, is not in accord with any known epidemiological facts concerning this disease. We think that such unequal distribution of the disease as shown by the above-mentioned records is proof quite convincing that malaria was not widely prevalent among the troops at Chickamauga. We have already seen that practically all of the prolonged malarials were actually cases of typhoid fever. Many of the temporary illnesses diagnosed as malaria may actually have been due to the plasmodium, but how many were due to this cause we can not positively state.

It is to be regretted that qualified men properly equipped were not placed earlier at all the national

encampments, in order to make scientific diagnoses of malaria and typhoid fever. Scientific medicine would have been greatly enriched had this been done. As soon as we began the inspection of camps and hospitals we saw that it was absolutely necessary to provide for scientific diagnoses. In the division hospitals we found that most of the febrile cases were diagnosed malaria. We believed that they were typhoid fever, but it seemed presumptuous in us to set our opinion above that of the very competent medical officers in attendance. We therefore asked the Surgeon-General that he should send competent men properly equipped for making blood examinations for the malarial plasmodium and the Widal test to each of the large camps. The Surgeon-General acted promptly on this suggestion, and we are therefore able to give some scientific information concerning the actual prevalence of malaria.

At Sternberg Hospital, Chickamauga Park, Maj. R. Emmett Giffen, surgeon in command of the hospital, established a bacteriological laboratory and placed the same under the charge of Acting Asst. Surg. Charles F. Craig. The following is Doctor Craig's report of the work done in this laboratory:

REPORT OF THE BACTERIOLOGICAL LABORATORY TO NOVEMBER 1,
1898.

STERNBERG UNITED STATES GENERAL HOSPITAL,
Chickamauga Park, Ga.

To Maj. R. EMMETT GIFFEN,

Chief Surgeon, U. S. Volunteers, Commanding Hospital.

SIR: I have the honor to submit to you the following report regarding the work of the bacteriological laboratory up to the present date.

As it was your intention in establishing the laboratory to aid in the scientific study of the cases treated in the hospital and to investigate certain questions concerning the sanitary condition in Chickamauga, I have endeavored to follow your suggestions and orders as closely as possible.

I have had associated with me for a short time Acting Asst. Surg. George Dock, of Ann Arbor, Mich., a most competent and acknowledged authority upon the fevers of the South, especially malaria, and I have also been ably aided by Dr. James Jobling, whom you detailed to me as laboratory assistant.

The work in the laboratory has been divided as follows:

(a) The study of typhoid-fever cases, including post-mortem examinations and the use of Widal's test; (b) the examination of the blood of suspected cases for the plasmodium malariae; (c) the bacteriological analysis of water; (d) the chemical and microscopical examination of urine, including the diazo reaction; (e) the study of the blood of typhoid cases; (f) the study of cases of special interest.

(a) There have been 10 post-mortem examinations made of subjects dead of typhoid fever, all of which demonstrated the pathological changes usually found in that disease. I have made several preparations illustrating very perfectly the changes occurring in the intestine, showing swelling, infiltration, ulceration, and perforation of Peyer's patches, and swelling of the solitary glands.

Of special interest have been the results obtained by Widal's serum test in the typhoid cases in the hospital. I have examined to date 315 cases, using the Widal test, with the following results:

Of the 315 cases, 208 were diagnosed as typhoid fever, 5 were diagnosed as malaria, 13 were diagnosed as questionable typhoid,

20 were diagnosed as measles, 1 was diagnosed as typho-malaria, 1 was diagnosed as simple fever, 1 was diagnosed as myalgia, 2 were diagnosed as pneumonia, 1 was diagnosed as cystitis, 1 was diagnosed as tuberculosis, 1 was diagnosed as questionable tuberculosis, 1 was diagnosed as thermic fever, 2 were diagnosed as dysentery, and 58 had no diagnosis.

Of the 208 cases diagnosed as typhoid, 205 cases reacted to Widal's test, while 3 did not.

These cases, with the exception of one, have since proven not to be typhoid.

The one is still in doubt.

Of the 5 cases diagnosed malaria, 2 reacted to the test and were undoubtedly typhoid, while 3 did not react.

Of the 20 cases diagnosed as measles, not one reacted to the test.

Of the 13 cases diagnosed questionable typhoid, 7 gave reaction, while 6 gave no reaction.

One case diagnosed "typho-malaria" gave a very marked reaction, and examination of the blood demonstrated that no plasmodia were present. This case was undoubtedly a straight typhoid.

One case diagnosed myalgia gave no reaction.

Two cases diagnosed dysentery; one reacted and proved to be typhoid, one did not.

One case diagnosed tuberculosis gave no reaction.

One case diagnosed tuberculosis gave reaction and proved to be typhoid.

One case diagnosed cystitis gave no reaction.

Two cases diagnosed pneumonia gave no reaction.

One case diagnosed thermic fever gave no reaction.

One case diagnosed "simple fever" gave a reaction and proved to be typhoid.

Of the 58 cases having no diagnosis, 30 reacted to the test, while 28 did not. Of the 28 which did not, 10 were too recent for the reaction to appear.

I have divided the reactions to the test as follows:

1. Character of reaction: Marked, 150 cases; medium, 58 cases; slight, 27 cases.

2. Time of reaction: Immediate, 95 cases; in five minutes, 64 cases; in ten minutes, 38 cases; in fifteen minutes, 25 cases; in twenty minutes, 8 cases; in twenty-five minutes, 6 cases.

The slowest reaction observed was complete within twenty-five minutes.

The earliest reaction was obtained upon the fourth day of the disease, the latest upon the sixtieth day. There were five reactions at the fourth day, eight at the fifth, ten at the sixth, five at the seventh, the remaining reactions ranging from the eighth to the fortieth day of the disease.

From the foregoing report it will be seen that the Widal serum test proved the diagnosis of typhoid fever in 99 per cent of the cases so diagnosed, there being one case still in doubt, and it further proved that at least 80 per cent of the sick in this hospital were suffering from typhoid fever. In cases other than typhoid the test gave a negative result of 100 per cent.

The Widal test has thus proved its great utility, and the results obtained in this laboratory conclusively show its great value as a diagnostic measure, and its therapeutic use as indicating the treatment to be pursued in doubtful cases. Many of the reactions were very marked, and demonstrated beautifully the inhibitory action of typhoid blood serum upon the movements of bacillus of typhoid.

The cultures used in making the tests were twenty-four-hour cultures, obtained originally from pure cultures sent to the laboratory from the laboratory of the United States Army Medical Museum and the laboratory of Johns Hopkins University.

(b) The examination of suspected cases for the malarial plasmodium has resulted in the demonstration of only four cases of malaria in this hospital since the laboratory was established.

Acting Asst. Surg. George Dock, during his work in this laboratory, demonstrated the tertian organism in one case, and since his

departure I have found the quartan in one case and the æstivo-autumnal in two cases.

(c) The bacteriological analysis of the water of Chickamauga Park has been carefully and steadily carried on, and I have already submitted to you three reports upon the examination of certain waters which you wished analyzed.

The results may be summed up as follows:

Samples of water from the following localities have been examined:

Chickamauga Creek, at Intake Spring, on Cave Spring branch of creek, North Well, first well south of North Well, second well south of North Well, Upper Ellis Spring, Lower Ellis Spring, Mullis Spring, Kelly House Well, Kelly Field Well, Brotherton Well, the wells upon Snodgrass Hill road, and Dyer House Well, Blue Spring, and Cloud Spring.

The following water was found pure and fitted for domestic use: From Chickamauga Creek, if filtered; North Well, second well south of North Well, Upper Ellis Spring, Kelly House Well, Kelly Field Well, Dyer House Well, second well on Snodgrass Hill road, Blue Spring, and Cloud Spring.

The water from the following localities was condemned: Spring on Cave Spring branch of Chickamauga Creek (contained *B. coli. communis*); first well south of North Well, on Lafayette road (contained *proteus vulgaris*); Lower Ellis Spring (too much bacterial life); Mullis Spring (too much bacterial life); Brotherton Well (too much bacterial life).

I have been unable to demonstrate the typhoid bacillus in any of the water examined.

(d) The work in urinary analysis has been divided into chemical, microscopical, and bacteriological.

The chemical examinations have been conducted by Doctor Jobling, about 200 samples having been analyzed.

The microscopical and bacteriological examinations, conducted by myself, have thus far shown nothing of special interest, unless it be the occurrence in the urine of typhoid cases of numerous bacteria, chiefly micrococci.

The diazo reaction has been applied in a large number of cases, and, while always present in typhoid, it also occurred in other diseases.

(e) I have examined bacteriologically the blood of twelve cases of typhoid fever, and will submit to you shortly a special report concerning the conclusions arrived at.

(f) I have paid special attention to the study of individual cases presenting special symptoms, and especially to those cases simulating the so-called "typho-malarial" fever of older writers. Within the last month I have found two cases of undoubted double infection, the plasmodium malarie and the typhoid bacillus being present at the same time in the same case. These cases are of great interest, and I will submit to you a special report concerning them, together with charts, etc.

The laboratory has been in operation only about five weeks, but its value has been proven from a practical as well as a scientific standpoint to the hospital, and has demonstrated the wisdom of your course in establishing it.

Had laboratory facilities been possible or available when the troops were first sent to the park, much of the sickness and distress which followed might have been prevented.

A special report regarding the relation of flies and other insects to the spread of typhoid fever will be submitted to you as soon as it can be prepared.

Respectfully submitted.

(Signed)

CHAS. F. CRAIG,

Acting Assistant Surgeon, U. S. Army.

The following is a copy of the report of Professor Dock:

REPORT ON EXAMINATION OF BLOOD IN UNITED STATES ARMY HOSPITALS, SEPTEMBER, 1898.

By GEORGE DOCK, M. D., of Ann Arbor, Mich.

On September 7 I received orders to proceed to Sternberg Hospital, Chickamauga, Ga. Arriving September 9, I received every aid and encouragement from the chief surgeon, Maj. R. E. Giffen. I found that Acting Asst. Surg. C. F. Craig had fitted up a laboratory for bacteriological investigations, and must here express my thanks for the courtesy with which he put at my disposal all the apparatus and a place for working. I therefore lost no time in beginning my investigations. I soon discovered that many cases were diagnosed "malaria" without any obvious reason so far as the well-known clinical peculiarities of malarial disease are concerned and without any attempt at differential diagnosis between malaria and typhoid fever. In some wards many cases were diagnosed malarial, in others none. I went through one of these wards with the acting assistant surgeon in charge, but the "dozens of cases of typical malaria" he said he had was, reduced to one doubtful case on examination of the history, temperature chart, and patient. Microscopic examination of the blood showed no parasites, and the Widal test was quickly positive. In this way a number of cases thought to be malarial were examined. In all the blood was free from parasites, the Widal test positive. Having made all the examinations requested by the surgeons, I began a personal examination of the patients, going through each ward in order, examining all the fever cases and making examinations of the fresh blood in all cases that seemed doubtful or otherwise important. In most of the cases quinine had been given, usually in large doses, up to 40 grains a day. This would have interfered with the examination in general, but inasmuch as the symptoms continued, the diagnoses were in some cases "continued malaria," "typho-malaria," or "mixed infection," and the surgeons in charge still adhered to the malarial character; many examinations were made in such cases, always with negative results. Out of 65 cases in which the blood was examined, 5 had had no quinine at all; 5 more had had none for several days before the examinations were begun. Among the former I included a case that had had one dose (0.6 gram) of quinine a few hours before the examination, and the only case in which parasites were found. This case was important in a number of ways. The notes are as follows:

Private McIntyre, Company H, Second Arkansas, ill five days with fever, slight chills, "pain all over," no nausea or vomiting. The bowels have been constipated. The tongue moderately large, the edge and tip rather red, the dorsum moist, with a thin white coat. The abdomen is retracted; pain in the epigastrium; there are no spots. The spleen can be easily felt an inch below the margin of the ribs; the edge is rounded and rather soft. The temperature on admission was 103.5°; it rose the same day to 104.3°; fell during the night to 101.5°, rose again to 104.2°, remaining there for several hours, then fell to 99.5°; rose soon after to 99.8°, where it remained until next day, the fourth after admission. It then rose from about 8 a. m. and reached 105.3° at 4 p. m. In the afternoon there was a slight chill. The temperature fell slowly, without sweating. The written diagnosis was typhoid fever. I saw the patient at 9.30 a. m. of this day, and being struck by the large size of the spleen, unusual at so early a stage in typhoid

^aThe comparatively small number of cases examined depends partly on the time spent in selecting promising cases out of a large number, often without temperature charts or histories, but more especially on the fact that in cases with negative results the examination is necessarily prolonged much beyond the time usually necessary to find germs in a positive case. In all examinations at least two good preparations were examined, and in some cases as many as ten examinations were made at different times.

fever, examined the blood. I must say that the appearance of the patient was not unlike that of one in the early stage of typhoid fever. The temperature was 100.4°. I found large numbers of parasites, almost every field ($\frac{1}{12}$ inch oil immersion) containing one. Most of them were in the small amoeboid stage, from $\frac{1}{4}$ to $\frac{1}{2}$ the diameter of the red corpuscles, and with fine pigment grains. There were also a few parasites in a more advanced stage almost filling the red cells, but without any signs of segmentation. The indications were that the patient had a double tertian infection, with one generation not numerous enough, in all probability, to produce a marked paroxysm. Soon after the examination the patient received a second dose of 0.6 gram of quinine, and the temperature fell to 98.5° at noon. Not knowing about the quinine at first, I was surprised to find the parasites disappearing about an hour after their discovery, and those present were in very slow motion. The temperature rose to 100.4°, then fell during the night to 98.5°, and remained below normal up to the time the patient was discharged, ten days later. Parasites were found for two days after defervescence. They were rare the last time they were found and almost motionless. The subjective sensations improved with the fall of the temperature and the patient remained well, having taken in all 1.2 grams of quinine (18.5 grains). The patient said he had chills in Arkansas in the spring.

I have described this case rather fully because it seems of considerable importance in more than one respect. In the first place it shows how a double-tertian malarial infection may easily simulate typhoid for a short time. (It seems worth noting that the surgeon in charge, Acting Assistant Surgeon Pinckney, is familiar with malarial fever in Charleston, S. C.) More important is the fact that, notwithstanding the peculiarity mentioned, a moderate dose of quinine at once cut the disease short, although, as is always the case, the organisms persisted for a short time after complete defervescence. From this fact and the ease with which recovery followed, it is not probable that the large number of cases diagnosed "malaria" were malarial alone, since almost all of them were treated with quinine, usually in larger doses than in this case. Many of them had from 1.5 to 2.5 grams daily for periods up to three weeks without any notable effect on the temperature. On the other hand, it is quite probable a few cases of fever that appear in the reports were really of malarial nature. In a number of cases I obtained histories from men that seem to have been malarial. But these rapidly recovered under the inevitable quinine. As a rule these patients were treated in quarters or in regimental hospitals, so that no charts were kept. I was unable to see any of these cases soon after defervescence while at Sternberg Hospital, but was more fortunate at Camp Meade.

The intensity of malarial infection in a locality like Chickamauga Park in summer can be estimated in general by the number of cases of simple intermittent fever observed. I know of no reliable statistics in the camp, but from my own investigations think the number must have been very small. I am confirmed in my belief by information kindly furnished by Maj. F. P. Robinson, surgeon of the Sixth United States Volunteers, who told me that in the two months his regiment was encamped in the park he had not had more than six cases of simple intermittent fever.

While the evidence for frequent malarial infection is, therefore, lacking, the clinical features of a very large proportion of the fever cases were those of typhoid fever, not differing on the whole from that disease as seen in other parts of the country, as well as in Europe. In some cases the skin and mucous membranes showed evidences of lack of care (bedsore, multiple abscess, ulcers of the mouth). Some cases showed marked depression, sometimes perhaps due to the large doses of quinine or to other antipyretics, or to overdoses of whiskey (half ounce every two hours from the time of admission). The course of the temperature in most cases was characteristic; the enlargement of the spleen was evident in many. The roseolar eruption was often present, but sometimes masked by innumerable spots due to flies and other insects. Blue spots I

saw in three cases, in all of which lice had apparently been present, but were not when I saw the patients. The stools in most cases were quite characteristic. In all the blood examinations on uncomplicated cases I made the leucocytes were diminished, or at least not increased. The Widal test was made in a number of cases by myself, confirming or clearing up the diagnosis. This test was made on a most extensive scale by Acting Assistant Surgeon Craig, who will report his results.

In two cases I made autopsies on the bodies of patients dead of typhoid fever. I append brief notes:

Charles Kirk, musician, Company B, Fourteenth New York, 18 years old. Admitted to Sternberg Hospital September 5, in ward of Acting Assistant Surgeon Barnhart. Patient felt ill one or two days before admission. Diagnosis: Typhoid fever. Temperature moderately high; marked delirium; for three days before death, vomiting and involuntary discharge of watery stools. Died September 15, 1898. Examined one hour after death. No rigor mortis; slight lividity on the back; face dusky; muscles dry and dark red; no Zenker's degeneration. Lungs collapsed, slight hypostatic congestion of the left lower lobe; rest of lungs anemic; free from lesions. Pleurae not diseased. Pericardium normal. Heart distended with fluid, dark blood; muscles firm and of normal appearance; valves normal. Spleen very large, estimated weight 1½ pounds; capsule smooth, section dark red; anemic; Malpighian bodies distinct. Kidneys slightly enlarged; pale; cortex wide; parenchyma, cloudy; Malpighian bodies prominent; pyramids, anemic. Ureters, negative. Bladder empty. The serosa of the ileum is red for about 2 feet above the valve. The appendix is red and swollen. The mesenteric glands are enlarged; red; those corresponding to the lower end of the ileum reaching the size of pigeon eggs. The mucous membrane of the stomach is red and ecchymosed. The ileum shows great swelling of the mucous membrane, folds being present all the way to the valve. The lower 5 feet of the gut show swelling of the solitary glands and Peyer's patches, the former reaching a diameter of 8 millimeters. Most of the lymphoid tissue is in the stage of medullary infiltration, but a few solitary nodules show superficial necrosis. The mucosa of the valve, the caecum, and appendix are red and swollen. Two of the largest mesenteric glands contain necrotic foci. The liver is large, the surface rough, section pale, acini distinct; the consistency is tough; the capsule of Glisson, increased. There are a few small gray areas on the section. Gall bladder full, not altered; the lymph glands at the neck are large and red.

Microscopic examination of the spleen pulp showed the absence of malarial pigment. Eberth's bacilli were cultivated from the spleen by Acting Assistant Surgeon Craig.

Case 11. Private Pudil, Company H, Thirty-first Michigan. Acting Assistant Surgeon Norris. Patient came from Knoxville to visit relatives. While in ward was noticed by surgeon in charge, who found a temperature of 104° F. Patient was sick two weeks after that, having fever rarely less than 103.5° F.; anxious and delirious all the time. September 11 there was a slight hemorrhage. September 15, complained of pain in the abdomen, which was found rigid. Diagnosis of perforation and peritonitis. Death, September 16.

Autopsy showed slight hypostatic congestion of both lungs; spleen enlarged; the lower end contained a hemorrhagic infarction 4 centimeters in diameter. The peritoneum is red, swollen, and rough all over, containing about a quart of thin, yellow, watery fluid containing yellow flakes of fibrin; and in the pelvis a small amount of thin yellow feces. The liver and spleen are also covered with thin fibrinous exudate. The serous surface of the lower part of the ileum is dark red or violet. About a foot above the caecum is a perforation 2 by 4 millimeters in diameter. The mesenteric glands are moderately enlarged. The mucosa of the ileum is moderately swollen. The Peyer's patches and solitary glands in the upper part of the diseased area are swollen, but with pitted, or reticulated, or gray surfaces. The Peyer's patches in the lower 3 feet of the ileum are ulcerated; some to the inner,

some to the outer muscular coat; one, 2 centimeters in diameter, to the serosa in a small part, without perforating. The perforating ulcer is 2.5 centimeters in diameter. Some of the ulcers have thickened edges, some not; all are clean, and a large one just above the valve is covered with healthy granulations. The mucous membrane of the cæcum is swollen and of dark violet color. The left kidney contains an anemic infarct 1 inch in diameter. The pelvis is red, swollen, and contains thin opaque mucous fluid. Bladder, unaltered.

Microscopic examination of the splenic pulp shows absence of malarial pigment.

In Knoxville I examined the blood of 14 patients diagnosed as having malarial or "typho-malarial" fever. In one case the diagnosis was "malarial jaundice," though the history pointed rather to acute indigestion, and there had been no actual icterus. Quinine had been used in all cases. The blood in all was negative. I saw a great many cases diagnosed malaria that were evidently typhoid, but all had taken quinine in large doses.

In the division hospital I became acquainted with a major and surgeon who had been making diagnoses of malaria ostensibly by the use of the microscope, both at Chickamauga and later at Knoxville. I was convinced that he was totally unable to recognize malarial parasites. Experts need only to be told, by way of proof, that in all cases he found the so-called parasites in large numbers, usually, as he said, in every red corpuscle. He demonstrated his inability to distinguish between red and white corpuscles in his own blood.

When I arrived at Camp Meade I found comparatively few cases with the diagnosis of malaria in the Second Division Hospital. Most of the surgeons claimed that malarial disease was very rare there. I found two wards, the so-called malarial wards (3 and 4), in which a great many cases had the diagnosis of malaria. I examined the blood of many of these, also of many recently admitted men and some suspicious cases in the other wards, to the number of 20, but without finding any parasites. As the bacteriological outfit was incomplete, Widal tests could not be made, but out of the so-called malarial cases at least two-thirds were evidently typhoid in the middle stage, some not yet definitely recognizable, and some convalescent. Some of the other cases appeared to be convalescent from malaria, without typhoid manifestations.

In the First Division Hospital I was told there were a great many cases of malaria and typho-malarial fever. Several so-called typical cases of the latter had no parasites, and were evidently uncomplicated cases of typhoid fever. One case proved to be malaria and is quite as instructive as the positive case found at Chickamauga.

Private Beyer, Company F, Fifteenth Pennsylvania, came two weeks before examination from Fort Sheridan (?), on the Potomac River. Four days later he began to have chills, and had, so far as he knows, three chills, tertian (?). He felt quite well the free days. The temperature had not been taken often enough to give the type. There had been a chill the day before examination, and the patient had taken 24 grains of quinine in two days. Soon after beginning the examination I found an organism almost filling a red blood corpuscle. I thought the patient was nearing a paroxysm, but on examining the preparation further I found no other parasites in two very good covers. The temperature taken then was 98° F., and the patient felt well. He had no doubt recovered for the time being, furnishing another example of the ease with which such infections can be broken up. Like the case previously described, he came to camp already infected. As a matter of diagnostic interest, it may be added that this was the only case among several hundred with fever examined by me with herpes on the lips.

To summarize: I found remarkably little evidence that malaria was prevalent in Sternberg Hospital, in Camp Meade, and in the division hospital at Knoxville, the only cases found having been imported.

Malarial infection was probably more common than the results of my blood examinations indicate, but was easily broken up, and malaria was an inconsiderable factor in the large number of fever cases that appear under various names in the hospital records of those camps.

I found no evidence of combined typhoid and malarial infection. Among so large a number of cases of typhoid fever in men from all parts of the country some cases of that kind must have occurred. The examinations of experienced observers, and especially of those who had opportunities for making autopsies in the city hospitals, to which many patients were sent with the diagnosis of "malaria," will be of great interest in this connection.

The nomenclature of fevers in the camps named was on the whole irrational and arbitrary.

GEORGE DOCK.

ANN ARBOR, MICH., October 17, 1898.

INTESTINAL DISORDERS IN THE FIRST AND THIRD ARMY CORPS.

Intestinal disorders were very common among these troops. It is safe to say that at least two-thirds of the officers and men at Chickamauga suffered more or less from some form of intestinal disturbance. These intestinal disturbances were recorded under different names according to the individual views of the surgeon in charge. Gastritis, gastro-enteritis, and enteritis seemed to have been favorite expressions under which many regimental surgeons recorded these cases. In some regimental records the above-mentioned terms appear almost to the exclusion of the word "diarrhea;" while in other regiments nearly all of these cases were recognized as acute diarrhea, which certainly was the correct diagnosis. We have carefully searched the records and fail to find any evidence of the existence of a case of amebic dysentery among these soldiers. In fact, true dysentery was certainly very rare. Most of the cases of intestinal disorder were diarrheas in which the lower part of the large intestine only was affected. In a few instances ulceration resulted. In most cases there was no elevation of temperature, and the men were excused from duty for from one to three days. We are inclined to attribute the diarrheas to infection with saprophytic germs brought from the sinks and deposited on the food by flies.

The relation of the intestinal disorders to typhoid fever is of considerable interest to us, and we have already gone somewhat extensively into this subject in the histories of the Sixth Ohio and the First West Virginia regiments. This matter is of sufficient importance to justify us in inquiring into it further. In the first place, it should be stated that the regimental surgeons followed no definite rules in their reports of intestinal disorders. Some of them evidently recorded every case reported to them, while others made record of only the more serious ones.

In the First Arkansas Volunteer Infantry 359 cases of diarrhea are recorded. In the same regiment there were 228 cases of probable typhoid fever. Sixty of the individuals who had typhoid fever had had some

previous intestinal disturbance. We have already called attention to the fact that in many instances the preceding intestinal disorder was evidently a part of the typhoid process. The following cases from this regiment are illustrations of this relation:

- No. 1. Dysentery, August 15 to 18; typhoid fever, August 20; furloughed August 21.
 No. 2. Diarrhea, June 14 to 16; typhoid fever, June 22; furloughed August 17.
 No. 3. Diarrhea, August 2 to 6; typhoid fever, August 14; furloughed August 23.
 No. 4. Dysentery, August 5 to 10; gastritis, August 16 to 18; continued fever, August 19; died September 19.
 No. 5. Gastritis, June 2 and 3; typhoid fever, June 10.
 No. 6. Diarrhea, July 7 to 10; typhoid fever, July 31; died August 9.
 No. 7. Diarrhea, August 10 to 16; typhoid fever, August 20.
 No. 8. Diarrhea, May 30 to 31; dysentery, June 2 and 3; typhoid fever, June 16.
 No. 9. Diarrhea, August 1 and 2; typhoid fever, August 12.
 No. 10. Dysentery, July 31 to August 3; typhoid fever, August 16.
 No. 11. Diarrhea, July 20 to 31; typhoid fever, August 2.
 No. 12. Diarrhea, June 7 to 10; typhoid fever, July 3.
 No. 13. Diarrhea, July 28 to 31; typhoid fever, August 15.
 No. 14. Diarrhea, July 26 and 27; typhoid fever, August 16.
 No. 15. Diarrhea, July 28 and 29; typhoid fever, August 19.
 No. 16. Diarrhea, August 29 to September 2; typhoid fever, September 7.
 No. 17. Diarrhea, July 29 to August 2; typhoid fever, August 15.
 No. 18. Diarrhea, August 6 to 12; typhoid fever, August 16.
 No. 19. Diarrhea, July 12 and 13; typhoid fever, August 31.
 No. 20. Diarrhea, May 30 and 31; diarrhea, June 15 to 18; typhoid fever, June 19.
 No. 21. Diarrhea, June 8 to 11; typhoid fever, June 24.
 No. 22. Diarrhea, June 6 and 7; typhoid fever, June 12.
 No. 23. Gastritis, August 19 and 20; typhoid fever, August 23.

It is possible that in all of these cases the intestinal disorder that preceded the typhoid fever occurred about the time of the typhoidal infection. We are inclined to believe that in many of these instances the infection was a mixed one and that the effect of this mixed infection was a diarrhea.

Of the 228 cases of probable typhoid fever in the First Arkansas Volunteer Infantry, 168 had no illness, so far as the record shows, preceding the typhoid fever. In other words, 73.68 per cent of the cases of typhoid fever were not preceded by any recorded intestinal disorder, while 26.32 per cent of the cases of typhoid fever were preceded by some intestinal disorder. However, in 23 out of the 60 cases which were preceded by some intestinal disorder the preceding intestinal disorder was probably due to the typhoid infection.

In the Fifty-second Iowa Volunteer Infantry there are recorded 691 cases of diarrhea, and there were in this regiment 345 cases of probable typhoid fever; 99 of the cases of probable typhoid fever were preceded by some recorded intestinal disorder. Of these the following may be of interest:

- No. 1. Diarrhea, August 13 to 18; typhoid fever, August 24.
 No. 2. Diarrhea, August 2 to 8; typhoid fever, August 15.
 No. 3. Diarrhea, August 14 to 17; typhoid fever, August 18.
 No. 4. Diarrhea, August 26 to 30; typhoid fever, September 7.

- No. 5. Diarrhea, August 2 and 3; typhoid fever, August 11.
 No. 6. Diarrhea, July 9 and 10; typhoid fever, July 25.
 No. 7. Diarrhea, July 11 to 13; typhoid fever, July 20.
 No. 8. Diarrhea, August 20 to 22; typhoid fever, August 28.
 No. 9. Diarrhea, July 31 to August 4; typhoid fever, August 19.
 No. 10. Diarrhea, August 20 to 26; typhoid fever, August 30.
 No. 11. Diarrhea, August 13 to 17; indigestion, August 18 to 20; typhoid fever, August 30.
 No. 12. Diarrhea, August 21 to 27; typhoid fever, August 30.
 No. 13. Diarrhea, August 4 and 5; typhoid fever, August 16.
 No. 14. Diarrhea, August 19 and 20; typhoid fever, August 21.
 No. 15. Diarrhea, July 20 to 22; diarrhea, July 24 and 25; typhoid fever, July 29.
 No. 16. Diarrhea, July 30 to August 18; typhoid fever, August 31.
 No. 17. Diarrhea, August 20 to 22; typhoid fever, August 24.
 No. 18. Diarrhea, August 15 to 19; typhoid fever, August 26.
 No. 19. Diarrhea, July 9 to 16; typhoid fever, August 3.
 No. 20. Diarrhea, August 19 to 24; typhoid fever, August 30.
 No. 21. Diarrhea, August 11 and 12; typhoid fever, August 13.
 No. 22. Diarrhea, July 3 and 4; diarrhea, July 9 to 16; diarrhea, July 23 to 26; typhoid fever, August 13.
 No. 23. Diarrhea, August 13 and 14; typhoid fever, August 31.
 No. 24. Diarrhea, July 5 and 6; typhoid fever, July 15.

We believe that in these cases it is more than probable that the preceding intestinal disorder resulted from a mixed infection, from which typhoid fever developed later. The following summary will show the principal facts concerning the relation between typhoid fever and intestinal disorders in this regiment:

Number of cases of intestinal disorder.....	691
Number of cases of probable typhoid fever.....	345
Number of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	246
Percentage of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	71.30
Number of cases of probable typhoid fever in which the preceding intestinal disorder probably had some relation to the subsequent typhoid fever.....	24

In the Second Missouri Volunteer Infantry 400 cases of intestinal disturbance are reported, while the number of probable typhoids was 268; 47 individuals appear on both of these lists. In the following cases a direct relation between the preceding intestinal disorder and the typhoid fever is regarded as probable:

- No. 1. Diarrhea, July 1 to 10; typhoid fever, July 14.
 No. 2. Diarrhea, September 6 and 7; typhoid fever, September 8.
 No. 3. Diarrhea, June 7 and 8; diarrhea, June 17 to 20; typhoid fever, June 28.
 No. 4. Diarrhea, August 15 to 17; typhoid fever, August 30.
 No. 5. Diarrhea, September 2 to 5; typhoid fever, September 8.

The following summary will show the principal facts concerning the relation between typhoid fever and intestinal disorders in this regiment:

Number of cases of intestinal disorder.....	400
Number of cases of probable typhoid fever.....	268
Number of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	121
Percentage of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	45.15
Number of cases of probable typhoid fever in which the preceding intestinal disorder probably had some relation to the subsequent typhoid fever.....	5

In the Ninth New York Volunteer Infantry the number of cases of diarrhea was 497, while the cases of typhoid fever numbered 323; 73 individuals appear on both of these lists. In the following cases it is probable that the preceding intestinal disorder had some relation to the typhoid fever:

- No. 1. Intestinal colic, July 30 and 31; typhoid fever, August 1.
- No. 2. Diarrhea, July 30 and 31; typhoid fever, August 3.
- No. 3. Gastritis, July 15 to 20; typhoid fever, July 26.
- No. 4. Diarrhea, July 5 and 6; typhoid fever, July 10.
- No. 5. Diarrhea, August 21 to 28; typhoid fever, September 10.
- No. 6. Diarrhea, July 2 to 5; typhoid fever, July 9.
- No. 7. Diarrhea, August 8 and 9; typhoid fever, August 19.
- No. 8. Diarrhea, August 12 and 13; typhoid fever, August 30.
- No. 9. Gastritis, July 30 to August 1; typhoid fever, August 7.
- No. 10. Dysentery, August 27 to 29; typhoid fever, August 30.
- No. 11. Diarrhea, June 9 to 12; typhoid fever, June 29.
- No. 12. Diarrhea, July 2 and 3; diarrhea, July 6 to 8; typhoid fever, July 19.
- No. 13. Intestinal colic, June 1 and 2; typhoid fever, June 10.
- No. 14. Diarrhea, July 18 to 29; typhoid fever, July 30.
- No. 15. Gastro-duodenitis, July 1 and 2; typhoid fever, July 28.
- No. 16. Gastro-enteritis, August 2 to 8; typhoid fever, August 17.
- No. 17. Diarrhea, July 29 to 31; typhoid fever, August 4.
- No. 18. Diarrhea, August 28 to 30; typhoid fever, September 5.
- No. 19. Indigestion, June 5 and 6; typhoid fever, June 14.
- No. 20. Diarrhea, August 18 to 20; typhoid fever, September 1.
- No. 21. Diarrhea, July 10 and 11; typhoid fever, July 20.
- No. 22. Diarrhea, June 25 and 26; typhoid fever, July 6.
- No. 23. Diarrhea, August 23 to 28; typhoid fever, September 3.
- No. 24. Diarrhea, August 13 to 16; typhoid fever, August 20.
- No. 25. Diarrhea, July 16 and 17; typhoid fever, July 18.
- No. 26. Diarrhea, August 22 and 23; typhoid fever, August 24.
- No. 27. Diarrhea, July 25 to 27; typhoid fever, July 30.
- No. 28. Intestinal colic, July 12 to 17; typhoid fever, July 18.

The following summary will show the principal facts concerning the relation between typhoid fever and intestinal disorders in this regiment:

Number of cases of intestinal disorder.....	497
Number of cases of probable typhoid fever.....	323
Number of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	250
Percentage of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	77.39
Number of cases of probable typhoid fever in which the preceding intestinal disorder probably had some relation to the subsequent typhoid fever.....	28

In the Sixty-ninth New York Volunteer Infantry the number of cases of recorded diarrhea is less than the number of cases of probable typhoid fever. This is the only regiment in which we found this to be the case. The number of diarrheas recorded amounts to 205, while there are 299 cases of probable typhoid fever; the number of individuals whose names are found in both of these lists is 57. In the following cases there is probably some relation between the preceding intestinal disorder and the typhoid fever:

- No. 1. Diarrhea, June 19 and 20; typhoid fever, July 9.
- No. 2. Gastritis, October 2 to 12; typhoid fever, October 16.
- No. 3. Dysentery, September 20 to 27; typhoid fever, October 1.
- No. 4. Dysentery, September 19 to 30; typhoid fever, October 11.
- No. 5. Diarrhea, July 20 to 24; typhoid fever, July 24.

No. 6. Gastritis, September 13 to 18; typhoid fever, September 18.

No. 7. Dysentery, July 19 to 24; typhoid fever, August 8.

No. 8. Dysentery, September 26 to October 1; typhoid fever, October 11.

No. 9. Dysentery, July 28 and 29; typhoid fever, August 3.

No. 10. Dysentery, August 2 to 8; typhoid fever, August 17.

No. 11. Diarrhea, July 17 and 18; typhoid fever, July 20.

No. 12. Diarrhea, July 18 to 21; typhoid fever, July 30.

No. 13. Dysentery, October 13 to 19; typhoid fever, October 23.

The following summary will show the principal facts concerning the relation between typhoid fever and intestinal disorders in this regiment:

Number of cases of intestinal disorder.....	205
Number of cases of probable typhoid fever.....	299
Number of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	222
Percentage of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	74.24
Number of cases of probable typhoid fever in which the preceding intestinal disorder probably had some relation to the subsequent typhoid fever.....	13

In the Eighth Massachusetts Volunteer Infantry 2,250 cases of intestinal disorder and 272 cases of probable typhoid fever are recorded; the names of 109 individuals are common to both of these lists. In the following cases the preceding intestinal disorder is regarded as having some relation to the typhoid fever:

No. 1. Gastro-enteritis, August 20 to 28; gastro-enteritis, September 1 to 13; diarrhea, October 11 to 15; sent to Fort Thomas with typhoid fever October 24. There can be but little doubt that this man was convalescing from typhoid fever when sent to Fort Thomas, and that the initial date of this disease should be given as August 20.

No. 2. Gastro-enteritis, August 30 to September 1; typhoid fever, September 7.

No. 3. Diarrhea, August 8 to 26; typhoid fever, September 3.

No. 4. Gastro-enteritis, September 10 to 15; typhoid fever, September 27.

No. 5. Gastro-enteritis, August 21 to 26; typhoid fever, September 7.

No. 6. Gastro-enteritis, September 10 to 17; typhoid fever, September 23.

No. 7. Diarrhea, August 15 and 16; typhoid fever, August 23.

No. 8. Gastro-enteritis, September 9 to 13; gastro-enteritis, September 19 to 22; typhoid fever, September 23.

No. 9. Gastro-enteritis, August 27 to September 1; typhoid fever, September 4.

No. 10. Diarrhea, August 9 to 15; diarrhea, August 30 to September 4; typhoid fever, September 25.

No. 11. Diarrhea, August 10 to 16; typhoid fever, August 17.

No. 12. Diarrhea, July 16 to 22; typhoid fever, July 23.

No. 13. Gastro-enteritis, September 11 to 13; gastro-enteritis, September 19 to 21; gastro-enteritis, September 27 to 30; typhoid fever, October 8.

No. 14. Gastro-enteritis, September 5 to 9; typhoid fever, September 24.

No. 15. Gastro-enteritis, September 8 to 12; typhoid fever, September 20.

No. 16. Gastro-enteritis, September 15 to 24; typhoid fever, October 3.

No. 17. Gastro-enteritis, August 9 to 14; typhoid fever, August 30.

No. 18. Acute diarrhea, August 9 to 14; typhoid fever, August 19.

No. 19. Gastritis, September 18 to October 24; gastritis, October 24 to November 4; typhoid fever, November 5.

No. 20. Gastritis, October 11 to 13; gastritis, October 15 to 20; typhoid fever, November 2.

No. 21. Gastritis, September 5 to 12; typhoid fever, September 29.

No. 22. Gastritis, September 19 and 20; typhoid fever, September 28.

No. 23. Diarrhea, August 26 to 28; gastro-enteritis, September 2 to 17; gastro-enteritis, September 19 to 25; typhoid fever, October 8.

No. 24. Gastro-enteritis, August 31 to September 6; gastro-enteritis, September 19 to 25; typhoid fever, October 5.

No. 25. Gastro-enteritis, September 6 to 11; typhoid fever, September 11.

No. 26. Gastro-enteritis, September 30 to October 2; typhoid fever, October 5.

No. 27. Gastro-enteritis, September 27 to 30; typhoid fever, October 5.

No. 28. Gastro-enteritis, September 10 to 18; typhoid fever, October 3.

No. 29. Gastro-enteritis, September 10 to 15; typhoid fever, September 24.

No. 30. Gastro-enteritis, August 22 to 26; typhoid fever, September 5.

No. 31. Gastro-enteritis, August 26 to September 1; gastro-enteritis, September 9 to 13; gastro-enteritis, September 15 to 30; typhoid fever, October 7.

No. 32. Diarrhea, August 4 to 6; typhoid fever, August 9.

No. 33. Gastro-enteritis, September 14 to 16; typhoid fever, September 16.

No. 34. Gastro-enteritis, September 9 to 13; typhoid fever, September 13.

No. 35. Diarrhea, August 11 and 12; gastro-enteritis, August 13 to September 6; diarrhea, September 7 and 8; diarrhea, September 8 to 20; gastro-enteritis, September 27 to October 5; convalescing from typhoid fever, November 5.

No. 36. Diarrhea, September 7 and 8; typhoid fever, September 14.

No. 37. Diarrhea, August 13 to 16; typhoid fever, August 16.

No. 38. Diarrhea, August 14 and 15; typhoid fever, August 18.

No. 39. Gastritis, August 19 to 22; typhoid fever, August 23.

No. 40. Gastro-enteritis, August 28 to September 5; gastro-enteritis, September 5 to 14; typhoid fever, September 29.

No. 41. Gastro-enteritis, August 27 and 28; typhoid fever, September 4.

No. 42. Diarrhea, August 13 and 14; gastro-enteritis, August 20 to September 15; typhoid fever, September 29.

No. 43. Gastro-enteritis, August 27 and 28; typhoid fever, September 1.

No. 44. Gastro-enteritis, September 6 to 8; typhoid fever, September 8.

No. 45. Gastritis, August 27 to September 2; typhoid fever, September 3.

No. 46. Gastro-enteritis, September 28 to October 7; typhoid fever, October 7.

No. 47. Gastro-enteritis, August 31 to September 5; typhoid fever, September 5.

No. 48. Diarrhea, August 9 to 14; typhoid fever, September 6.

No. 49. Diarrhea, August 9 and 10; diarrhea, August 11 to 18; typhoid fever, September 3.

No. 50. Diarrhea, August 19 to 22; diarrhea, August 27 to September 1; typhoid fever, September 4.

No. 51. Diarrhea, August 27 and 28; typhoid fever, August 29.

No. 52. Diarrhea, August 31 to September 2; typhoid fever, September 2.

No. 53. Gastro-enteritis, September 4 to 12; typhoid fever, September 12.

No. 54. Gastro-enteritis, August 22 to 26; gastro-enteritis, August 30 to September 2; gastro-enteritis, September 4 to 15; typhoid fever, September 15.

No. 55. Gastro-enteritis, September 1 to 18; typhoid fever, September 19.

No. 56. Gastro-enteritis, September 16 to 22; gastro-enteritis, September 27 to October 7; typhoid fever, October 14.

No. 57. Gastro-enteritis, September 21 to 28; typhoid fever, October 11.

No. 58. Gastro-enteritis, September 4 to 11; typhoid fever, September 11.

It will be seen that in many of the above given cases the preceding intestinal disorder could not have been other than a part of the typhoid fever itself. The following summary will show the principal facts concerning the relation between typhoid fever and intestinal disorders in this regiment:

Number of cases of intestinal disorder.....	2,250
Number of cases of probable typhoid fever.....	272
Number of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	163
Percentage of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	59.92
Number of cases of probable typhoid fever in which the preceding intestinal disorder probably had some relation to the subsequent typhoid fever.....	58

In the Second New York Volunteer Infantry 822 cases of intestinal disorder and 161 cases of probable typhoid fever are recorded; the names of 56 individuals appear upon both of these lists. In the following cases there is most probably some relation between the preceding intestinal disorder and the typhoid fever:

- No. 1. Acute diarrhea, July 12 and 13; typhoid fever, August 4.
- No. 2. Diarrhea, July 15 to 17; typhoid fever, August 8.
- No. 3. Diarrhea, August 3 to 6; typhoid fever, August 12.
- No. 4. Diarrhea, August 1 to 7; typhoid fever, August 20.
- No. 5. Diarrhea, July 21 and 22; typhoid fever, August 14.
- No. 6. Indigestion, August 12 to 14; typhoid fever, August 20.
- No. 7. Diarrhea, July 16 and 17; typhoid fever, August 8.
- No. 8. Diarrhea, July 9 and 10; diarrhea, July 18 to 19; typhoid fever, August 5.
- No. 9. Indigestion, August 22 to 24; typhoid fever, August 29.
- No. 10. Diarrhea, July 20 and 21; typhoid fever, July 26.
- No. 11. Diarrhea, July 16 and 17; diarrhea, July 20 to 23; typhoid fever, July 31.
- No. 12. Diarrhea, July 28 to August 2; typhoid fever, August 20.
- No. 13. Diarrhea, July 31 to August 1; typhoid fever, August 15.
- No. 14. Diarrhea, July 3 to 9; typhoid fever, July 10.

The following summary will show the principal facts concerning the relation between typhoid fever and intestinal disorders in this regiment:

Number of cases of intestinal disorder.....	822
Number of cases of probable typhoid fever.....	161
Number of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	105
Percentage of cases of probable typhoid fever not preceded by any recorded intestinal disorder.....	65.21
Number of cases of probable typhoid fever in which the preceding intestinal disorder probably had some relation to the subsequent typhoid fever.....	14

The relation of the intestinal disorders to typhoid fever became more prominent as the season advanced. The intestinal disorders of May and June very infrequently show any relation to typhoid fever, while those of July and August frequently show such a rela-

tion. Apparently, the diarrheas of May and June had no protective influence against subsequent infection with typhoid fever, while there can be but little doubt that the diarrheas of July and August did show such a protective influence. We have already suggested an explanation for this in our discussion of the history of the Eighth New York. Since writing that part of the report, we have gone minutely into the history of other regiments, and the opinion expressed at that place has been confirmed by our subsequent studies.

Our conclusions concerning the relation between intestinal disorders and typhoid fever among the troops of the First and Third Army Corps may be summarized as follows:

(1) A large proportion (averaging at least 75 per cent) of the cases of typhoid fever were not preceded by any intestinal disorder.

(2) In a fair proportion of the cases of typhoid fever which were preceded by some intestinal disorder it is more than probable that the preceding intestinal disorder resulted from saprophytic germs taken into the body simultaneously with typhoid germs. The effects of the saprophytic germs were shown almost immediately and manifested themselves in some intestinal disorder, while the effects of the typhoid germs did not appear until later.

(3) We are inclined to the opinion that in these cases the difference in time between the appearance of the intestinal disorder and the development of the subsequent typhoid fever represents the period of incubation of the latter disease. If this supposition be true, the period of incubation varies from two days to three weeks.

(4) The intestinal disorders of May and June very infrequently had any relation to typhoid fever.

(5) The intestinal disorders of July and August frequently gave temporary immunity against typhoid fever.

(6) Typhoid fever was, in a large proportion of the cases of that disease, due to a mixed infection. It is probable that in many of the cases in which this mixed infection occurred the diarrhea, induced by the saprophytic micro-organisms, so thoroughly removed the specific germs of typhoid fever that the individual did not develop the latter disease and did acquire, for the time being at least, a certain degree of immunity to typhoid fever.

(7) We certainly are justified in concluding that the intestinal disorders among these troops did not predispose the individuals affected by them to typhoid fever.

CHAPTER VIII.

TYPHOID FEVER IN THE SECOND ARMY CORPS, CAMP ALGER, VA.

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INTRODUCTION.

This camp site, which was selected as a rendezvous for the Second Army Corps, commanded by Maj. Gen. W. H. Graham, U. S. Volunteers, is located $7\frac{1}{4}$ miles west of Washington, D. C., and about $6\frac{1}{2}$ miles south of the Potomac River.

TOPOGRAPHY.

We have been unable to procure a detailed topographical map of the site of Camp Alger. We have been informed by Lieut. Col. James L. Lusk, U. S. Volunteers, chief engineer, Second Army Corps, that preparations for a map of this kind were well advanced, but that the want of time and the press of other duties prevented its completion.

The point occupied as headquarters is elevated 408 feet above the Potomac River and was the highest point in the camp site. The average elevation of the regimental camp sites above the Potomac River was about 300 feet.

The general surface of the camp site is decidedly undulating, being well provided with open spaces for regimental or brigade encampment and interspersed with native forests.

By consulting the map of this camp site it will be seen that it is traversed by a few small brooks and provided with a number of shallow springs.

GEOLOGICAL FORMATION AND WATER SUPPLY.

We are indebted to Lieutenant-Colonel Lusk, U. S. Volunteers, for valuable information concerning this camp site, and from whose letter we quote the following:

The layer of soil is quite thin and is underlaid by a stratum of very impervious clay. * * * This stratum of clay appears to extend well down toward the rock, being generally separated from the latter by a layer of fine sand, generally called quicksand by the drillers. With a few exceptions this rock of the gneiss family is covered by a layer of so-called "rotten rock," which grew harder downward.

Although at first the shallow springs, already referred to, and neighboring farm wells were depended upon as a source of water supply, it was soon clearly seen that other means would have to be provided to meet the urgent demands for a better and purer supply of water. An attempt had been made to anticipate this want on the part of a few regiments by ordinary dug wells located in their own regimental camps.

As there were no bathing facilities, the men, in most instances, were marched to the small branches of Accotink Creek, several miles away, or to the Potomac River, still more distant.

On May 25, 1898, the first troops having arrived on May 18, an artesian well was completed in the neighborhood of the camp of the Sixth Massachusetts and the Eighth Ohio regiments. This well supplying a fair yield of soft, clear, and palatable water, the pressure for others of the kind in different parts of the camp became very great.

A board appointed by the War Department reported on June 2, 1898, in favor of other artesian wells for each regiment, or a series of wells from which the water could be pumped to the regimental camps. The first of these plans was adopted, and we are informed that about June 5 additional drilling machines were sent to the camp by the Quartermaster's Department, and that the sinking of the wells was ordered to be

prosecuted as rapidly as possible until there should be one for each regiment. This work was under the immediate supervision of the chief engineer of the Second Army Corps. By reference to the map of this camp site the date on which these wells were completed, as well as their depth and height above the Potomac River, may be ascertained.

We here again quote from Lieutenant-Colonel Lusk's letter:

During the formative period of the camp the regiments arrived in rapid succession, before any corps headquarters had been established or corps staff organized. Many thousand men were thus got into camp grounds of insufficient area, with no water supply except from a few ordinary dug wells, springs, and small streams. The streams became at once polluted and unfit for use. The few wells and springs affording an insufficient supply, even for drinking and cooking, relief was sought by digging shallow wells or sinking driven wells of small depths, using small pipe, both classes of wells being sunk in the regimental camps, or by excavating holes in wet ground and forming so-called springs. The relief thus obtained was precarious so far as concerns quantity, as the water was sure to fail upon the advent of dry weather.

We may state that this demand for a better water supply was not fully met, notwithstanding the most energetic action on the part of the chief engineer officer, until about the end of June.

GENERAL LOCATION OF REGIMENTAL CAMP SITES.

These were, as a general rule, well selected and had good natural drainage, being situated on knolls mostly cleared, but sometimes on wooded hillsides. In a number of instances, however, they were unnecessarily limited in area.

Lieut. Col. Charles Smart, deputy surgeon-general, U. S. Army, having completed an inspection of Camp Alger, Va., states, under date of July 13, 1898, at which time a number of the regiments had already occupied their camp sites for nearly two months, as follows:

The striking characteristics of the camps of the First Division were overcrowding of tents on the camp site, overcrowding of men in the tents, dust, sun glare, and fetid odors. The Eighth, Twelfth, and Thirteenth Pennsylvania were packed closely together, with scarcely an interval between the regiments, the company streets hardly wider than the intervals between adjacent companies should have been, tents of the same companies in contact with each other on the sides, and of adjacent companies in contact by the ends.

These regiments constituted the Third Brigade of the First Division, and probably presented the worst overcrowding to be found among any of the brigades encamped at Camp Alger. The condition of affairs in the First Brigade, First Division, was only slightly better, except that the Sixty-fifth New York Volunteer Infantry, belonging to this brigade, had more space.

According to Lieutenant-Colonel Smart, the regimental camps of the Second Division were generally more expanded than those of the First Division.

DISPOSITION OF GARBAGE AND EXCRETA.

Garbage was deposited in open pits near the company kitchen, and sinks were placed at varying distances beyond the garbage cesspools.

Referring to the regiments of the First Division, Lieutenant-Colonel Smart again says:

The kitchens were close up against the company tents, with uncovered cesspools for kitchen slops and garbage, and the sinks were also so close that, although some care was given to covering the deposits with earth, the sink odor pervaded the company streets.

We may state that during the months of June and July this condition of cesspools and sinks was common to all of the organizations brought together at this camp site. Their contents were left much of the time uncovered, even during the dry weather prevailing in June, and their condition was rendered still more intolerable after the advent of wet weather, since, owing to the high level of the ground water, the contents of the sinks floated to the surface and could not be covered without filling in the pits.

TENTAGE.

At the time of our inspection of Camp Alger, Va., beginning August 20, 1898, the several regiments constituting the First Division of the Second Army Corps, together with the three other regiments belonging to a separate brigade, were well supplied with all necessary tents, but the latter were unprovided with any flooring. This condition as to sufficient tentage did not characterize the earlier days of Camp Alger, since, according to the best available testimony, some of the regiments arrived with too little tentage for their full strength, and hence the men were for a time too much crowded in the tents.

RAINFALL AND TEMPERATURE.

Before taking up the medical history of individual regiments, especially the occurrence of typhoid fever in these, we may state that very dry weather prevailed during the latter part of May and the month of June, and that it was not until about the 20th of July that the first heavy rainfall occurred at Camp Alger. This amounted to 1.1 inches. On the 28th day of June there was a fall of rain amounting to 0.7 of an inch. During the latter part of July and until the middle of August there were repeated heavy rainfalls, but the weather was dry during the last half of August and the first half of the month of September, at which time the camp was abandoned.

As regards the temperature, the weather was extremely hot, and this condition prevailed practically during the whole encampment. (See Meteorological Chart, Camp Alger.)

TYPHOID FEVER IN THE FIRST DIVISION, SECOND ARMY CORPS.

SIXTY-FIFTH NEW YORK VOLUNTEER INFANTRY.

First Brigade, First Division, Second Army Corps.

[Abstract of surgeon's statement—Maj. Albert H. Briggs, U. S. Volunteers.]

The Sixty-fifth New York Infantry was assembled at Camp Black, Hempstead, N. Y., and remained encamped at that point from May 2 to May 19, 1898. During this time the weather was cold and there was considerable rain. All suffered from the exposure. The principal diseases were referable to the lungs—coughs, acute bronchitis, tonsillitis, etc.—with some diarrheal troubles. No case of typhoid fever occurred at this camp.

The regiment left Camp Black, Long Island, on May 19, and arrived at Camp Alger, Va., on the following day. It was placed in camp near the "Brick House," occupying ground which was fairly well drained. On arrival at Camp Alger the weather was very warm, and this great change in temperature was doubtless the cause of considerable diarrhea. The health of the men during May was nevertheless remarkably good, considering the marked climatic changes to which they were subjected.

The water supply at this camp was very limited, both officers and men suffering from lack of water. It was obtained from a so-called spring, which was in reality only a ditch. At the end of the first week holes were dug near the ditch to a depth of about 5 feet and barrels sunk in these. In this way a larger supply of water, objectionable in character, was obtained, although this was far from being sufficient. This water was used without filtration or boiling. The camp was well policed and the sinks well cared for.

One case of typhoid fever appeared in this camp—Private Adam Kuster, Company M, Sixty-fifth New York, who was admitted on May 21 and transferred to the general hospital at Fort Myer on May 25.

The regiment remained at this first camp site till June 7, a period of seventeen days, when it was removed to a more elevated, better drained, and somewhat shaded location near the Seventh Ohio Infantry. The water supply in this camp was obtained from a deep well, which furnished an abundance of clear, cold, odorless water. This well, however, was so placed as to receive in its vicinity the drainage of the First Brigade. No other regiment used this water. The men were quartered in Sibley wall tents, sixteen men to a tent. No flooring was used, but all slept on the ground. This camp was well policed, and the sinks for the reception of fecal matter were on lower ground and well looked after.

Twenty-four cases of typhoid fever occurred in this second camp during the period from June 7 to August 8, 1898. Twenty-one of these cases were confined to the First Battalion, and 17 of these occurred in one

company, Company E. No case of typhoid fever appeared in this camp until about five weeks had passed. The first case (second in regiment) occurred in Company B on July 6. Cases of typhoid fever occurred thereafter in Company E as follows:

Date.	Number of cases.
July 10.....	1
11.....	1
15.....	2
16.....	1
17.....	1
18.....	1
20.....	3
22.....	1
25.....	2
26.....	1
29.....	1
Aug. 1.....	1
3.....	1
Total.....	17

The regimental surgeon has been unable, even after patient investigation, to ascertain the origin of this outbreak of typhoid fever in Company E. All of the men of the regiment were placed under the same sanitary conditions as to food, water supply, and location, except that Company E occupied next to the lowest ground in the camp, being placed between Companies L and M.

The men of this company were from Jamestown, N. Y., and were all men of means who had money to spend and hence purchased more articles of food and drink from surrounding "shacks" and venders than any other company in the regiment. This company also received more boxes from home than the other companies. Company E used about 3 gallons of milk daily, principally for cooking purposes. This milk was obtained from a milkman who lived about 7 miles away. Major Briggs investigated the health of the milkman's family as well as that of several other families from which he obtained a part of his milk supply, but found no cases of typhoid fever. Halfway to camp from the milkman's house there was a pump by the road, and the family living there had cases of typhoid fever. This he considered as offering a possible explanation of the outbreak of the disease in Company E. The same milk supply was, however, used by Companies L and M, and no cases of fever had occurred in either of these. Another possible explanation was that Company E had cesspools in its company street—one cesspool to two tents, intended for the reception of waste water. These cesspools had been used for about three weeks, when they had become so foul and offensive as to necessitate their closure. A third possible explanation was the arrival at Camp Alger on July 3 of three cars containing thirty-eight wagonloads of food stuffs. These cars were sent by the Buffalo Evening News, and contained food of various kinds, such as boiled hams, fowls, canned stuffs, cakes, pastries, etc. The following morning 154 men presented themselves at surgeon's call, all suffering with diarrhea. Company E lived riotously for a few days. Typhoid fever appeared about two weeks later.

The regiment had moved into its present and third camp since reaching Camp Alger on August 8, 1898. This site was suitable in all respects, elevated, well drained, and exposed to the sunlight. Water supply was hauled in barrels from springs at much inconvenience. Sinks were kept in good condition, each man being required to cover his stool at once with dry earth.

Typhoid fever has continued to occur in this encampment. Up to this date (August 21) there have been a total of 46 cases; Companies E and F having had 19 and 8 cases, respectively. Only a few cases have occurred in the other companies of the regiment. Companies I and K have had no cases.

REMARKS BY THE BOARD.

An examination of the regimental reports of sick and wounded of the Sixty-fifth New York Infantry shows that for the month of May, 1898, the mean strength of the regiment was, officers, 50; enlisted men, 980; total, 1,030.

There were 94 admissions to sick report, of which—

Acute catarrhal affections of the respiratory tract contributed.	15
Acute diarrhea	26
Typhoid fever	1
Undetermined fever	1
All other diseases	51

There were no malarial fevers reported.

The diarrheas were of short duration, as a rule lasting from twenty-four to forty-eight hours.

The case of undetermined fever was returned to duty at the end of two days.

The case of typhoid fever, Private G. Kerslake, Company H, was admitted on May 18 and transferred to the field hospital, Camp Black, May 19, 1898.

It is not possible to determine from the regimental returns whether sickness was markedly increased at Camp Alger, Va., during the last ten days of May, since the report of sick practically begins with the arrival of the regiment at that camp.

We note the admission to sick report on May 25 of Private L. T., Company L, Sixty-fifth New York Infantry, with the diagnosis of acute gastroenteritis. He was transferred to the Fort Myer General Hospital May 27, where later symptoms of meningitis developed, leading to a fatal result on June 6. This case should be regarded with suspicion.

For the month of June, in an average strength of 1,103 officers and enlisted men, there were 377 admissions, as follows:

Acute diarrhea	91
Acute dysentery	23
Intermittent fever	15
Remittent fever	4
Undetermined fever	23
Typhoid fever	0
All other causes, chiefly vaccination	221

The cases of diarrhea and dysentery were mild in character, only 4 cases lasting more than five days. Of the 6 cases transferred to division hospital 5 were sent to duty within three days, while the diagnosis in 1 case was changed to remittent fever, the duration of the disease being sixteen days. The case dated from June 17.

Of the 15 cases diagnosed as intermittent fever 9 were treated in quarters and were of the following duration: Two to four days, 5; five days, 2; six days, 1; eight days, 1. Six were transferred to division hospital; 5 of these were returned to duty within three days, and 1 was changed to the diagnosis of typhoid fever.

The cases of remittent fever were of less than seven days' duration.

Only 2 of the cases of undetermined fever were more than six days in duration. Private C. F. M., Company M, Sixty-fifth New York, admitted June 29 as "fever undetermined," was transferred to hospital on July 7, where the diagnosis was changed to subacute enteritis, the case being returned to duty July 14, and again admitted July 21 as chronic diarrhea, and again sent to duty on July 30.

Private C. W. B., Company B, admitted June 24 as "fever undetermined," was sent to duty June 30, but readmitted July 7 as suspected typhoid and transferred to First Division Hospital on July 13, where the diagnosis was changed to typhoid fever.

It thus appears that 2 cases of typhoid fever occurred in this regiment during the month of June, viz, Company A, 1 case, changed from intermittent fever, June 15; Company B, 1 case, changed from fever undetermined, June 24; and that there were 2 other cases of possible typhoid fever, viz, Company K, June 17, 1 case, diagnosed as diarrhea and intermittent fever, lasting sixteen days; and Company M, June 29, 1 case, diagnosed as undetermined fever, subacute enteritis, and chronic diarrhea, lasting thirty-one days.

In an average strength for July of 1,326 officers and men, there were 301 admissions for all causes, as follows:

Acute diarrhea	94
Febricula	3
Intermittent fever	8
Fever undetermined	17
Typhoid fever	18
All other causes	161

The cases of diarrhea were, as a rule, short in duration, 80 being returned to duty in less than three days and all to duty within nine days.

Seven cases diagnosed as intermittent fever were returned to duty within five days; 1 was transferred to division hospital and changed to typhoid fever.

Of the 17 cases of undetermined fever, 12 were treated in quarters and were less than four days in duration; 5 were transferred to First Division Hospital, where 3

seen that the disease continued to steadily increase in the old camp, there being 26 cases recorded for the first eight days of the month, and that, notwithstanding the removal of the regiment on August 8, there was no apparent reduction of cases ten days or two weeks later, as might have been anticipated; and this in spite of strenuous efforts to maintain the camp in the best sanitary condition.

It will also be seen that the disease was very unequally distributed among the several companies of the regiment; that while certain companies, such as F, C, B, A, and L, had a large percentage of men affected, other companies had but few cases.

Water at this time was obtained from various springs, but was distributed alike, so that the source or sources of infection should be sought elsewhere than in the water supply. In the crowded condition in which the men of this regiment were living—16 men to each Sibley wall tent—infected articles of bedding and clothing probably had much to do with the propagation of the disease, while a certain number of cases were infected from sources outside of the camp.

The regiment left Camp Alger, Va., September 4 and arrived at Buffalo, N. Y., September 5. Officers were granted leave of absence and men furloughed for thirty days, with orders to reassemble at the State arsenal, Buffalo, N. Y., on October 6, 1898.

STRENGTH FOR SEPTEMBER.

Officers	48
Enlisted men	1,270
Admissions:	
Acute diarrhea	8
Continued fever	4
Intermittent fever	2
Remittent fever	1
Typhoid fever	11
All other causes	12
Total	38

The cases of diarrhea were of short duration.

One case of continued fever lasted four days. The other 3 cases of this disease, as well as the 3 cases of malarial fever, could not be further traced.

The report for September only embraces the period September 1 to 3. Nine of the cases of typhoid fever reported were admitted on September 1, and 2 cases on the 3d. For the remainder of September it is not possible to give the dates of occurrence of cases of this disease.

That many additional men were already infected prior to leaving Camp Alger, Va., is shown by the October report of sick and wounded, which begins with October 6, the day on which the men reassembled at Buffalo, N. Y., after thirty days' furlough. On the latter date all cases occurring between September 5 and October 6 were taken up on sick report. Among these we find 48 cases of typhoid fever, which, with the 9 cases admitted between September 1 and 3, would give 57 cases

of typhoid fever for September, distributed by companies as follows:

Company A, 7 cases; Company B, 7 cases; Company C, 9 cases; Company D, 3 cases; Company E, 3 cases; Company F, 6 cases; Company G, 3 cases; Company I, 5 cases; Company K, 8 cases; Company L, 3 cases; Company M, 2 cases; band, 1 case; total 57 cases.

The regiment was mustered out of service November 19, 1898. No cases of typhoid fever were recorded for this month.

SUMMARY.

Assembled at Camp Black, Hempstead, N. Y., remaining encamped from May 2 to 19, 1898.

Arrived at Camp Alger, Va., May 20, 1898.

Had one case of recognized typhoid fever at State encampment.

Imported one case of recognized typhoid fever.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 15, 1898.

Typhoid fever in the Sixty-fifth New York Volunteer Infantry, by months.

	May.	June.	July.	August.	September.	Total.
Recognized cases.....	2	2	24	127	57	212
Probable cases.....		2		5		7
Total	2	4	24	132	57	219

The cases of recognized typhoid fever (212) were diagnosed as follows:

Typhoid fever.....	152
Intermittent fever	2
Undetermined fever	4
Acute gastritis.....	1
Typhoid suspect.....	17
Intermittent, remittent, continued, or undetermined fever ...	36

The cases of probable typhoid fever (7) were diagnosed as follows:

Diarrhea and remittent fever	1
Undetermined fever, subacute enteritis, and chronic diarrhea	1
Malarial fever.....	1
Continued fever	1
Undetermined fever	1
Typhoid suspect	2
Total cases of recognized and probable typhoid fever.....	219
Number of deaths from recognized typhoid fever.....	14
Per cent of mortality among recognized typhoid-fever cases ..	6.60
Per cent of mortality among recognized and probable typhoid-fever cases	6.39

Left Camp Alger, Va., September 4, 1898.

Arrived at Buffalo, N. Y., September 5, 1898, and furloughed thirty days, with orders to reassemble October 6, 1898, at State arsenal, Buffalo, N. Y.

SEVENTH OHIO VOLUNTEER INFANTRY.

First Brigade, First Division, Second Army Corps.

[Abstract of surgeon's statement—Maj. D. A. Rainels, U. S. Volunteers.]

The Seventh Ohio Infantry was mustered into service May 14, 1898, at Columbus, Ohio, and remained there till May 19, 1898.

The regiment arrived at Camp Alger, Va., on May

21, and went into camp near the "Brick House." Prior to leaving Columbus a member of Company D was sent to one of the city hospitals, on May 16, with the diagnosis of typhoid fever. This case was afterwards reported as a case of meningitis. The day following the arrival of the regiment at Camp Alger, Private B., Company M., was transferred to the hospital at Fort Myer, Va., as a case of typhoid fever. He had been sick only two days.

On June 7 the regiment changed its camp to the high ground next to the site occupied by the Sixty-fifth New York Infantry. The same day Private J. C. W., Company D., was sent to the division hospital, and died on June 13 of typhoid fever. This soldier had been on pass in the city during the first week of the Camp Alger encampment. About the middle of June the regiment went on a practice march up the Potomac River. July 1 one of the field officers was taken sick with what seemed to be a malarial attack, with some diarrhea. July 3 he availed himself of sick leave and went to his home, where he died July 15 of typhoid fever. July 8 Company C, recruited on the second call for volunteers, arrived from Gallipolis, Ohio. This company brought one case of typhoid fever, which was transferred to hospital July 9. July 19 one of the officers of this company left on leave and developed typhoid fever soon after reaching home. Both of these are believed to have been contracted prior to the arrival of the company at Camp Alger. A few more cases of typhoid fever occurred during the month of July; otherwise the health of the men was very good.

The regiment moved into its third camp at Camp Alger on July 25. This was an elevated site, well drained, and very desirable. In this camp also water was obtained from a bored well, which also furnished water to the First New Jersey Infantry. A few sporadic cases of typhoid fever have developed in this camp. As to the origin of this disease at Camp Alger the regimental surgeon has no explanation to offer.

REMARKS BY THE BOARD.

Concerning the May report of sick and wounded, the surgeon states that measles and diarrhea have been the prevailing complaints, and that the water supply for both drinking and cooking purposes was insufficient.

In an average strength of 818 officers and men there were only 21 admissions from May 14 to 31, as follows:

Acute diarrhea	7
Intermittent fever	2
Typhoid fever	2
Other causes, chiefly measles	10

The diarrheas were of less than forty-eight hours' duration.

The cases of intermittent fever lasted two and seven days, respectively.

The first case of typhoid fever occurred on May 14, in Company D, and was transferred to one of the hos-

pitals in Columbus, Ohio, on May 16. The second case occurred in Company M on May 21, and was transferred to Fort Myer the following day. So that, although the health of the men was very good for May, this regiment imported at least one case of typhoid fever into its camp in Virginia.

The surgeon states that 410 recruits were received during June and distributed equally among the eleven companies; that while the older soldiers remained almost free from bowel complaints the recruits had a good deal of diarrhea.

Strength for June	1,221
Admissions:	
Acute diarrhea	44
Intermittent fever	7
Typhoid fever	0
Typhoid suspect	1
Measles	12
All other causes	60
Total	124

Forty cases of diarrhea were treated in quarters and were returned to duty within three days. Four cases were sent to division hospital and returned to duty within four days.

The cases diagnosed as intermittent fever were of short duration. Of the 2 cases transferred to hospital, 1 was returned to duty after three days and 1 could not be traced.

The case diagnosed as typhoid suspect, Private C. S., Company A, was admitted June 14 as acute diarrhea, returned to duty June 15, readmitted as typhoid fever June 18, and transferred to division hospital June 19, where all further record is lost.

The regiment moved into its second camp on June 7, near that of the Sixty-fifth New York Infantry, and about the middle of June went on a practice march to the Potomac River and return.

Average strength for July, 1,313 officers and men. Admissions, 194, divided as follows:

Diarrhea	15
Intermittent fever	16
Remittent fever	1
Typhoid fever	2
Typhoid suspects	7
Measles	13
All other causes	140

The cases of diarrhea were of short duration, only 1 case lasting eight days.

The cases of intermittent fever were treated in quarters, none of which were of more than three days' duration. Six cases were sent to division hospital, of which 5 were returned to the regiment within four days and 1 changed to typhoid fever.

The case of remittent fever was changed to the diagnosis of measles in the division hospital.

Of the 7 cases diagnosed as typhoid suspects, 3 were returned to duty within three days, and in 4 cases the

diagnosis of typhoid fever was confirmed at the Fort Myer General Hospital.

We also find that Private W., Company D, admitted to division hospital June 18 with gonorrhea, was transferred to the general hospital at Fort Myer on July 9 as a case of typhoid fever, death occurring on July 13. The date of the commencement of the attack in this case can not be fixed. This is the case reported by the surgeon as admitted on June 7, with fatal termination June 13.

Thus, for the month of July, we find that 11 cases of typhoid fever have occurred in this regiment, as follows:

Date.	Company.								Field officer.	Total.
	A.	C.	D.	F.	G.	K.	L.	M.		
July 1.....	1								1	2
8.....		1						1		2
9.....	1		1							2
16.....							1			1
17.....							1			1
25.....					1					1
30.....				1		1				2
Total ..	2	1	1	1	1	1	2	1	1	11

To these should be added the case of an officer of Company C, who arrived with his company on July 8 and left on sick leave July 19; disease, typhoid fever. This case, mentioned in the surgeon's statement, does not appear on any of the records.

On July 25 the regiment moved to a new camp site near Dunn Loring, Va.

Concerning the report of sick and wounded for August, the surgeon remarks that the character of the malarial disease seemed to change from an intermittent to that of a remittent type, and that typhoid fever had markedly increased, notwithstanding all precautions taken against its spread.

SUMMARY FOR AUGUST.

Average strength.....	1,284
Admissions:	
Diarrhea	19
Dysentery	2
Intermittent fever.....	48
Remittent fever.....	15
Undetermined fever.....	28
Typhoid fever	20
All other causes.....	114
Total.....	246

Of the 21 intestinal cases, 19 were treated in quarters and returned to duty within five days; 2 were transferred to hospital, of which 1 was changed to typhoid fever and 1 furloughed after four days without diagnosis.

Eighteen cases of intermittent fever were treated in quarters and returned to duty after periods varying from one to eight days. Thirty cases were sent to division hospital; of these, 2 were changed to remittent fever and returned to duty within four days; 4 were furloughed as remittent fever at periods varying

from four to twelve days; 2 were furloughed as diarrhea; 1 changed to diagnosis of bubo; 1 to intercostal neuralgia; 15 to diagnosis of typhoid fever, and 5 could not be traced.

Of the cases of remittent fever, 12 were treated in quarters and returned to duty within one to nine days; 3 were sent to hospital, of which 1 was furloughed as continued fever, and 2 changed to the diagnosis of typhoid fever.

The cases of undetermined fever were transferred to hospital and disposed of as follows: Four cases returned to duty after four to eleven days as remittent fever; 2 furloughed as remittent fever after twenty-four hours' treatment; 1 changed to the diagnosis of gastric catarrh; 1 to acute bronchitis; 8 to the diagnosis of typhoid fever, and 12 cases could not be traced.

In addition, 4 cases of typhoid fever were found in the First Division Hospital whose names had been omitted from the regimental sick report for August, thus bringing the total number of recognized cases of typhoid fever for this month to 50, instead of 20 as reported by the surgeon. (See chart of the Seventh Ohio Infantry.)

We observe that following the change of camp site on July 25 typhoid fever made but slight progress, only 11 cases of the disease having occurred up to August 16, but from that time cases increase in number, so that 41 cases are recorded for the last half of August. We also observe that 12 cases, or nearly one-third, occurred in one company (M). Seven occurred in Company F. With these exceptions, no other company had more than 5 cases, and four companies only 2 cases each. As the water supply, obtained from a deep well, was common to all of the companies, this can be excluded as a common source of infection.

The regiment left Camp Alger on September 1, going direct to Columbus, Ohio, where it was encamped until September 27.

No strength is given for the month of September. The surgeon reports as follows:

Intestinal disorders (all short)	10
Intermittents (10 of which were short and 10 transferred to hospital)	20
Cases of remittent fever (16 of which lasted less than five days and 34 transferred to hospital).....	50
Cases of typhoid fever	11

We have been able to find 22 cases of typhoid fever among the supposed malarial cases sent to division hospital and St. Francis Hospital, Columbus, Ohio, thus making 33 cases of this disease for the month of September. We do not think, however, that this number expresses the full prevalence of the disease during September, as nearly one-half of the hospital cases could not be traced.

On September 27 the men were granted verbal furlough for thirty days, the companies reassembling October 26.

The surgeon remarks on the October report of sick and wounded that "Many of the men were taken sick after reaching home; most of these recovered sufficiently to report at the end of the furlough, while others developed typhoid fever." He further reports that for the month of October it was not possible to keep a correct account of the sick, as the men were quartered in different parts of the city of Columbus. He reports 21 cases of typhoid fever as "admitted from verbal furlough" for October. These cases, together with the 4 other cases traced by the board, are not included in the cases charted for the Seventh Ohio, as correct dates for admission could not be found.

The regiment was mustered out of service on November 6, 1898.

SUMMARY.

Mustered into service May 14, 1898, at Columbus, Ohio.

Arrived at Camp Alger, Va., May 21, 1898.

Had 1 case of recognized typhoid fever at State encampment.

Imported 1 case of recognized typhoid fever.

Company C, arriving July 8, imported 2 cases of recognized typhoid fever.

Date of first case of recognized typhoid fever after arrival at Camp Alger, Va., June 14, 1898.

Typhoid fever in the Seventh Ohio Volunteer Infantry, by months.

	May.	June.	July.	August.	Sep-tember.	Octo-ber.	Total.
Recognized cases	2	1	12	50	33	25	123
Probable cases				2			2
Total.....	2	1	12	52	33	25	125

Total cases of recognized typhoid fever..... 123

Total cases of probable typhoid fever..... 2

Total cases of recognized and probable typhoid fever.. 125

Number of deaths from recognized typhoid fever..... 4

Per cent of mortality among recognized cases of typhoid fever..... 3.25

Per cent of mortality among recognized and probable cases of typhoid fever..... 3.20

Left Camp Alger, Va., September 1, going direct to Columbus, Ohio.

Furloughed on September 27 for thirty days.

Reassembled October 26, 1898.

FIRST NEW JERSEY VOLUNTEER INFANTRY.

First Brigade, First Division, Second Army Corps.

[Abstract of surgeon's statement—Maj. Henry Allers, U. S. Volunteers.]

The regiment was mustered in at Seagirt, N. J., from May 7 to May 12, 1898, and remained at that point till about May 20, when it left for Camp Alger, Va., arriving on May 21. No case of typhoid fever had developed at the State camp ground, and no case occurred at its first camp site at Camp Alger.

About the beginning of the second week in June the regiment was placed in a second camp, located in the pines, adjacent to that of the Seventh Ohio Infantry, on ground which had been occupied by the Fourth Mis-

souri Infantry. Typhoid fever appeared in this second camp, its origin being attributed by Major Allers to previous infection of the soil by the Fourth Missouri Infantry. There was not sufficient room at this site to allow proper space between the tents. Water was obtained from brooks and was insufficient in quantity. The regiment was supplied with A wall tents, four men occupying a tent. The men were guarded very strictly in the matter of visiting "shacks" and purchasing from irresponsible venders. The general good health of the men was attributed to this fact. The first case of typhoid fever occurred on July 4 in this camp, and has been followed by a number of cases both in July and August. To the present time (August 23) there have been about 40 cases with 3 deaths. Company M has had more cases than the other companies.

The regiment moved to its third camp site at Camp Alger early in August. This camp was unobjectionable, both as to position and drainage. Water was obtained from a driven well. There has been some diminution in the cases of typhoid fever in this camp, although the disease still continues.

REMARKS BY THE BOARD.

Average strength for May, 1,030 officers and men; admissions to sick report, 129, as follows:

Intestinal diseases.....	38
Malarial, intermittent	6
Bronchial diseases.....	23
Typhoid fever.....	0
All other causes.....	62

Diarrheal diseases were mild in character, all cases being returned to duty within two days except 2 cases, transferred to First Division Hospital, which could not be traced.

No malarial cases lasted longer than forty-eight hours.

During the month of June, in an average strength of 1,334 officers and men, there were 129 admissions to sick report, divided as follows:

Intestinal diseases.....	53
Intermittent fever.....	11
Continued fever.....	1
Typhoid fever.....	0
All other causes.....	64

No case of diarrhea was under treatment longer than seven days. Cases diagnosed as intermittent fever were of short duration. The case diagnosed as continued fever went to duty at the end of twenty-four hours. Thus the health of the regiment up to the end of June was good.

The regiment retained its camp site in July. During this month, in an average strength of 1,330 officers and men, there were 142 admissions to sick report, as follows:

Intestinal diseases.....	53
Malarial fever.....	20
Continued fever.....	2
Typhoid fever.....	3
Typhoid suspects.....	2
Other diseases and injuries.....	62

Of the cases of intestinal disorder 51 were treated in quarters and returned to duty within four days; 2 cases were transferred to division hospital, of which 1 was returned to duty after twenty-five days, diagnosis changed to chronic dyspepsia, and 1 was changed to the diagnosis of typhoid fever.

Fifteen cases diagnosed as malarial fever were treated in quarters, of which 10 were returned to duty within two days, 2 after three days, 2 after six days, and 1 case (an officer) reported "absent, sick" was changed to typhoid fever. Of the 5 cases transferred to division hospital, 3 returned to duty within five days, diagnosis unchanged; 1 was changed to bronchitis, and to duty after twelve days, and 1 to acute enteritis. The latter could not be further traced.

Of the 2 cases diagnosed as continued fever, 1 was admitted July 2 as acute diarrhea, was returned to duty July 3, readmitted to sick report July 4 as continued fever, and transferred to division hospital the same day, where the diagnosis was changed to typhoid fever. The other case was transferred to the general hospital at Fort Myer July 6, where the diagnosis was changed to "pneumonia, complicating typhoid fever," the patient dying on the 12th of July.

The diagnosis in the 2 cases of typhoid suspects was afterwards confirmed. We thus find the following cases of typhoid fever, 9 in number, in this regiment during July, viz:

Date.	Com- pany.	Number of cases.
July 2	G	1
4	K	1
4	L	1
23	M	1
25	A	1
28	B	1
28	D	1
31	E	1
31	L	1
Total		9

We further observe that the first case did not appear until about six weeks after the arrival of the regiment at Camp Alger and about three weeks after its occupancy of the ground vacated by the Fourth Missouri Infantry. The occurrence of the cases as above given would seem to exclude the theory entertained by Major Allers of previous soil infection. Besides, our investigation will show that no case of typhoid fever had appeared in the Fourth Missouri Infantry while occupying this site. We observe that 4 companies of the First New Jersey Infantry have as yet had no cases of the disease.

During the first week in August this regiment moved into its third camp site at Camp Alger, occupying elevated ground near the site of the Seventh Ohio Infantry.

SUMMARY FOR AUGUST.

Average strength	1,366
Admissions:	
Intestinal diseases	20
Intermittent fever	59
Typhoid fever	11
Not diagnosed	1
All other causes	72
Total	163

Seventeen intestinal cases were treated in quarters, and were of the following duration: One to three days, 15; five to seven days, 2. Three cases were sent to hospital. Of these 1 was returned to duty after fourteen days, diagnosis unchanged; 1 was changed to typhoid fever, and 1 could not be traced.

Thirty-three cases of intermittent fever treated in quarters were returned to duty as follows: One to three days, 26; four to six days, 7. Twenty-six cases were sent to hospital with the following result: Two changed to the diagnosis of constipation and returned to duty after two to thirteen days; 3 changed to remittent fever and to duty after fourteen to nineteen days; 2 to intermittent fever and to duty after four days; 2 furloughed as remittent after seven to thirteen days, and 1 as intermittent after three days; 1 furloughed after six days without diagnosis; 4 changed to the diagnosis of typhoid fever, and 11 of which no record can be found.

The case not diagnosed by the surgeon was changed to typhoid fever in the division hospital. We have also found another case of typhoid fever under treatment in the First Division Hospital not accounted for by the surgeon, thus making a total of 18 cases for the month of August.

The First New Jersey Volunteer Infantry left Camp Alger on September 2 for Camp Voorhees, Seagirt, N. J.

In an average strength of 1,326 for this month, 54 admissions to sick report are reported as follows:

Intermittent fever	20
Intestinal diseases	3
Typhoid fever	5
All other causes	26

Three malarial cases were returned to duty within four days, the remaining 17 cases being furloughed after periods varying from one to fourteen days. No further record could be obtained in these cases except in one instance—a private of Company D, who died of typhoid fever at his home on October 18.

The intestinal disorders were furloughed. One of these also died of typhoid fever at his home October 17. The surgeon reports the death of a member of Company D, which occurred at his home on September 16, but does not give the date of his admission to sick report.

Only eight cases of typhoid fever are therefore re-

ported for September. Whether this represents the total cases for this month can not be stated. It probably, however, falls below the actual number, but concerning this point we have been unable to obtain accurate information. As bearing upon the number of cases, we have been able to find 8 deaths in this regiment due to typhoid fever in a total of 35 cases recorded. This would indicate either an unusually high mortality or a larger number of cases than we have been able to trace, probably double the number recorded. However this may be, the health report of this regiment during the Alger encampment must be regarded as remarkably good, both as to the small number of intestinal and malarial diseases that occurred, as well as for the comparatively small number of cases of typhoid fever. No case of remittent fever is recorded for the entire encampment, even for the month of August.

The regiment was mustered out of service on November 4, 1898.

SUMMARY.

Mustered into service at Seagirt, N. J., May 7 to 12, 1898.
Arrived at Camp Alger, Va., May 21, 1898.
Had no typhoid fever at State encampment.
Did not import typhoid fever into Virginia camp.
Date of first case of recognized typhoid fever after arrival at Camp Alger, July 2, 1898.

Typhoid fever in the First New Jersey Volunteer Infantry, by months.

	July.	August.	September.	Total.
Recognized cases.....	9	18	8	35
Probable cases.....				23
Total.....	9	18	8	58

Total cases of recognized typhoid fever..... 35
Total cases of probable typhoid fever..... 23

Total cases of recognized and probable typhoid fever..... 58
Number of deaths from recognized typhoid fever..... 8
Per cent of mortality among cases of recognized typhoid fever..... 22.85
Per cent of mortality among recognized and probable cases of typhoid fever..... 13.79

Left Camp Alger September 2, 1898, for Camp Voorhees, Seagirt, N. J.

SIXTH ILLINOIS VOLUNTEER INFANTRY.

Second Brigade, First Division, Second Army Corps.

[Maj. Frank Anthony, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was mustered into service at Camp Tanner, Springfield, Ill., during the early part of May, 1898.

The regiment arrived at Camp Alger, Va., on May 21, 1898.

The surgeon (Maj. Frank Anthony) states that the prevailing diseases at Camp Tanner were pneumonia, cold, and typhoid fever, these being caused by crowding in buildings poorly adapted for such purposes. He

adds that 2,400 men were quartered in a brick building with cement floor, and that the weather was cold and rainy during the greater part of the three weeks while camped here. Prior to its departure from Camp Tanner, Ill., a case of typhoid fever was admitted from Company A on May 15, and transferred to one of the city hospitals, where the soldier died on May 21. Five other cases, diagnosed as "bilious," were sent to city hospitals between May 15 and May 17. The subsequent history of these cases we have not been able to trace.

For the month of May, in a mean strength of 49 officers and 975 enlisted men, there were 43 admissions to sick report, namely:

Diarrhea and biliousness.....	14
Malarial fever.....	6
Typhoid fever.....	3
All other causes.....	20

Of the intestinal cases, 1 was returned to duty at the end of twenty-four hours. The remaining cases, reported as transferred to hospital, could not be traced, nor could the 6 cases diagnosed as malarial fever be found among the admissions to the Second Division Hospital.

Of the 3 cases reported as typhoid fever by the regimental medical officer, 1 has already been referred to as occurring on May 15 at Camp Tanner, Ill. One other, admitted from Company B, on May 30, with diagnosis "bilious, complicated with typhoid malaria," was transferred to Fort Myer, Va., and found to be a case of typhoid fever. The third case reported by the surgeon was changed in general hospital to acute pleurisy. This regiment, therefore, imported typhoid fever into its Virginia camp.

During the month of June, in a mean strength of 48 officers and 1,256 enlisted men, there were recorded 159 admissions to sick report, as follows:

Bilious.....	31
Diarrhea.....	36
Malaria.....	3
Undetermined fever.....	8
Typhoid fever.....	0
All other causes.....	81

The cases diagnosed as malaria or undetermined fever were of short duration; likewise 6 diagnosed as bilious or diarrhea, except in 2 cases of the former, which were changed to the diagnosis of typhoid fever in the division hospital. These cases were admitted on June 20 and June 29, both from Company B.

The regiment, consisting of 50 officers and 1,266 enlisted men, left Camp Alger on July 5 for service in Porto Rico. The surgeon states that the monthly sick report is as nearly complete as could be made with the regiment divided into four sections. Only 21 admissions are recorded, namely:

Bilious.....	13
Malaria.....	4
Typhoid fever.....	3
All others.....	1

One case diagnosed as bilious was returned to duty at the end of seven days. Four cases were transferred to St. Francis Hospital, South Carolina, of which no further record has been obtained. Eight were transferred to the hospital ship *Lampasas*, of which 3 were changed to the diagnosis of typhoid fever and 5 have not been traced.

The cases of typhoid fever reported by the surgeon were confirmed in the hospital.

We thus find 6 cases of typhoid fever for the month of July.

We have been unable to follow the movements of this regiment during the months of August and September while it was still serving in the island of Porto Rico. The strength of the regiment for these two months is not given.

The admissions for August are recorded as 257, as follows:

Malarial fever.....	156
Bilious	58
Undetermined fever.....	11
Typhoid fever.....	3
All other causes.....	29

Of the 69 cases diagnosed as bilious or undetermined fever, we have been able to trace 54, all of which were changed to the diagnosis of typhoid fever. This number, added to the 3 cases reported by the surgeon, brings the total cases for this month to 57. (See chart.)

The admissions for September were 119, divided as follows:

Malarial fever.....	97
Typhoid fever.....	1
All others.....	21

The examination of the hospital records from Porto Rico and the hospital ship *Lampasas* shows that 8 supposed malarial cases were changed to the diagnosis of typhoid fever. Later records of this regiment have not been accessible.

The regiment was mustered out at Springfield, Ill., November 25, 1898.

SUMMARY.

Mustered into service at Springfield, Ill., during the early part of May, 1898.

Arrived at Camp Alger, Va., May 21, 1898.

Had 1 case of typhoid fever at State encampment.

Imported 1 case of typhoid fever into its Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 20, 1898.

Typhoid fever in the Sixth Illinois Volunteer Infantry, by months.

	May.	June.	July.	August.	September.	Total.
Recognized cases.....	2	2	6	57	8	75

(Probable cases not estimated.)

Total cases of recognized typhoid fever.....	75
Number of deaths from recognized typhoid fever.....	8
Per cent of mortality among recognized cases of typhoid fever	10.66
Left Camp Alger July 5, 1898, for Porto Rico.	

SIXTH MASSACHUSETTS VOLUNTEER INFANTRY.

Second Brigade, First Division, Second Army Corps.

[Maj. Otis H. Marion, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was mustered into service at Framingham, Mass., May 13, 1898.

It arrived at Camp Alger, Va., May 22, 1898, and remained encamped at this point until July 5, 1898, when it left for service on the island of Porto Rico.

No regimental reports for the month of May are available for study.

During June, in an average mean strength of 45 officers and 1,068 enlisted men, there were 391 admissions to sick report, viz:

Diarrhea.....	275
Malarial fever.....	10
Febricula	4
Typhoid fever.....	5
Not diagnosed.....	7
All other causes.....	90

These figures are taken from the regimental report of sick and wounded.

The intestinal disorders were all of short duration, as a rule not lasting more than two or three days, except 2 cases lasting six days each and 1 case fifteen days. A case admitted on June 2 from Company E, with diagnosis acute diarrhea, and transferred to Fort Myer on June 22, was there changed to the diagnosis of typhoid fever.

The cases of febricula were returned to duty within forty-eight hours, and the supposed malarial fevers did not last longer than three days.

Of the cases reported as "not diagnosed," we have been able to trace 3 in the division hospital, where the diagnosis of typhoid fever was given in each instance.

The cases reported as typhoid fever, 5 in number, by the regimental medical officers were confirmed.

Thus we find for the month of June 9 cases of typhoid fever occurring in this regiment. The earliest case, already mentioned, was admitted on June 2 from Company E, and followed by a second and third case, on June 16 and 18, from Companies M and H. This regiment, therefore, probably imported 1 case of typhoid fever into its Virginia camp.

As already stated, the regiment left Camp Alger on July 5, and landed at Guanica, P. R., on July 25, having been quartered on the U. S. S. *Yale* from July 8 to the date of disembarkation above given. The regiment changed camp twice prior to July 31.

In a mean strength of 45 officers and 1,263 enlisted men for July, there were 137 admissions, namely:

Diarrhea.....	7
Fevers.....	2
Febricula	36
Typhoid fever.....	42
Not diagnosed.....	1
All other causes.....	49

The cases of diarrhea were reported as transferred to the field hospital at Guanica, and to hospital ship *Lampasas*. We have been unable to trace these cases further.

The cases reported with diagnosis of fever and febricula were transferred either to the division hospital, Guanica, or to the hospital ship *Seneca*. Of these we have been able to trace 6 cases only, in each of which the diagnosis was changed to typhoid fever.

The case entered as "not diagnosed" was also changed to typhoid fever.

The diagnoses in the 42 cases of typhoid fever reported by the surgeon were confirmed, so that 49 recognized cases of this disease occurred during the month of July. Five were reported prior to the regiment's departure from Camp Alger. Seven other cases may be traced to infection at the Virginia camp.

Thirty-four additional cases were admitted to division hospital on July 26. Although we have been unable to obtain the exact commencement of the disease in these cases, we are confident that they should be ascribed to an earlier date than July 26. From an investigation made by Lieutenant-Colonel Senn, U. S. Volunteers, the conclusion was reached that the majority of these cases were infected prior to the disembarkation of the men on the island of Porto Rico. In other words, the Sixth Massachusetts Infantry imported a large number of cases of typhoid fever into its camp on Porto Rican soil.

During the following months of August and September the disease increased to a certain extent.

The following are the remarks concerning the movements and camp sites, as obtained from the Adjutant General's Office, during August:

August 1, broke camp at Tallaboa at 7.30 a. m., and as part of main body the regiment marched to Ponce, 12 miles, Company L having been left at Yauco as garrison. The sun was hot and the men were exhausted. Marched through Ponce to camp ground, arriving at 4.30 p. m. The camp was located on an old sugar field. Remained in Ponce until August 9. The camp at Ponce was carefully graded and policed. There was a good water supply at some distance. The weather was dry, but showery. Company L joined the regiment from Yauco the evening of August 5. Companies B and D arrived from Guanica August 8. Health of command good.

Broke camp August 9 at 8 a. m. en route for Adjuntas. Arrived at Guaraguaires coffee plantation about 3.30 p. m.; men in good condition.

Broke camp August 10 at Guaraguaires at 1.20 p. m. in a rain storm, and proceeded to coffee plantation at Povenir, about 6 miles distant, when a halt was made, in a driving rain, and part of the regiment was quartered in and under buildings, the rest building fires and sitting about them. Few tents were pitched, as the men's shelter-tent rolls were on ox teams, some of

which did not arrive until next day. The men were very wet, having forded several streams, and it having rained all night.

August 11 part of the bull teams arrived with rolls and supplies, and camp was broken at 1 p. m. and proceeded to Adjuntas, 6 miles distant. There were showers while on the way. Reached Adjuntas about 4 p. m., and camped on a plateau on the top of a hill near the town. Very heavy rains on August 12.

August 13, broke camp at 8 a. m. and marched to Utuado, arriving at 3.15 p. m., with the men in good condition. Camped on a large sugar plantation bordering on the river. Continual rains; ground very wet; many men suffering from dysentery. Company F was left at Adjuntas. Part of the company joined the regiment on August 19; the remainder, August 20.

August 21, fair, with occasional showers; very large sick list; many men suffering from diarrhea; many men without hats, shoes, and other articles of clothing. August 22, fair; ground dry. August 23, fair; ground dry, but smells bad. Sick list on the increase; men suffering from diarrhea.

August 24, fair in the morning. Broke camp at 2.30 p. m. to move into the town of Utuado; slight showers in the afternoon. The regiment was quartered in coffee storehouses and schoolhouses.

In a mean strength for August of 44 officers and 1,226 enlisted men there were 529 admissions to sick report, as follows:

Intestinal disorders.....	440
Fevers.....	10
Febricula.....	47
Typhoid fever.....	1
Not diagnosed.....	8
All other causes.....	23

These figures are taken from the regimental report.

As regards the duration of the cases of diarrhea, no disposition, in a large majority of these cases, appears to have been entered on the records. In 24 cases the diagnosis was changed to typhoid fever in division hospital or on hospital ships.

Of cases diagnosed as fever and febricula, 6 were changed to typhoid fever.

The 8 cases entered as "not diagnosed" were also changed to typhoid fever.

In addition to these cases of typhoid fever, we have been able to trace 21 additional cases found in division hospital and on hospital ships, thus bringing the number to 60 cases for the month of August.

We also find, of the cases of intestinal disease and febricula, 63 of these changed to the diagnosis of malarial fever, 58 of which lasted less than ten days and 5 exceeding that time in duration.

During the month of September the regiment remained in camp at Utuado. On September 24 a detail of three men was made to boil water for the regiment, which heretofore had been done by companies or not at

all, the object being to decrease sickness which, in part, had been caused by water the men drank.

In a mean strength of 42 officers and 1,255 enlisted men for September, we find 1,080 admissions to sick report, divided as follows:

Intestinal disorders.....	619
Malarial fever.....	5
Febricula.....	83
Typhoid fever.....	2
All other causes.....	371

These figures are taken from the regimental report.

Without attempting to enter into detail as to the duration of the cases of intestinal disorder, fevers, and febricula, we may state that 67 of these cases were later changed to the diagnosis of typhoid fever and 130 to the diagnosis of malarial fever.

During the month of October the companies of the regiment were frequently moved from place to place, until October 20 and 21, when the regiment went aboard the transport *Mississippi*, in San Juan harbor. On October 22 the *Mississippi* left San Juan for Boston, arriving there on October 27, when the officers and men were given seven days' leave of absence, and ordered to report on November 3, to be verbally furloughed sixty days.

In a mean strength of 43 officers and 975 enlisted men for the month of October there were 596 admissions to sick report, namely:

Intestinal disorders.....	235
Malarial fever.....	12
Febricula.....	39
Typhoid fever.....	3
All other causes.....	307

We have been able to trace 8 other cases of typhoid fever for this month which were changed from the diagnosis of diarrhea and febricula, and to ascertain that 54 other cases were changed to the diagnosis of malarial fever in division and general hospitals. No further records from this regiment are available for study.

The regiment was mustered out at South Framingham, Mass., January 21, 1899.

SUMMARY.

Mustered into service at South Framingham, Mass., May 13, 1898.

Arrived at Camp Alger, Va., May 22, 1898.

No case of typhoid fever in State encampment.

Probably imported 1 case of typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 16, 1898.

Typhoid fever in the Sixth Massachusetts Volunteer Infantry, by months.

	June.	July.	August.	September.	October.	Total.
Recognized cases.....	9	49	60	67	11	196

^a Five of these occurred at Camp Alger and 7 are traceable to infection at Camp Alger.

(Cases of probable typhoid fever not estimated.)

Total cases of recognized typhoid fever.....	196
Number of deaths from recognized typhoid fever.....	18
Per cent of mortality among cases of recognized typhoid fever.....	9.17

Left Camp Alger July 5, 1898, for P. R.

Arrived at Guanica, P. R., July 25, 1898.

Left San Juan Harbor, Porto Rico, October 22, 1898.

Arrived at Boston, Mass., October 27, and furloughed seven days with orders to report on November 3 to be verbally furloughed for sixty days.

EIGHTH OHIO VOLUNTEER INFANTRY.

Second Brigade, First Division, Second Army Corps.

[Maj. E. C. Farquhar, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was mustered into service at Columbus, Ohio, on May 13, 1898, and arrived at Camp Alger, Va., on May 19.

Its admissions from May 13, the date of muster in, to May 31, were 39, namely:

Diarrheal diseases.....	11
All others.....	28

All cases were returned to duty after a brief interval, except a case of heart disease, which terminated fatally.

The records of this regiment are very incomplete. The strength for June is not given. The admissions for this month were 67, of which diarrhea contributed 27 cases and all other causes 40 cases.

Intestinal cases were of short duration, except 1 case, admitted to sick report from Company B on July 27; transferred to Second Division Hospital as typhoid suspect, and thence to Fort Myer, Va., where the case was diagnosed as one of pleural effusion of left side, and returned to duty July 25.

The regiment left Camp Alger on July 5 for service in Cuba, arriving at Santiago on July 13. Between the dates July 13 and 28, 26 admissions are recorded, namely:

Diarrhea.....	6
Malarial fever.....	8
Typhoid fever.....	1
All other causes.....	11

Two deaths are recorded for this month—1 from typhoid fever and 1 from malaria.

The case of typhoid fever we note was admitted from Company K on July 12, and hence points to infection prior to the departure from Camp Alger. The soldier died July 28.

The case reported as death from malarial fever was admitted from Company H on July 23, ten days after arrival at Santiago, the soldier dying on July 31. The true character of this case must remain in doubt.

For the months of August, September, and October no reports are accessible.

For the period November 10 to 21, 107 admissions to sick report are reported, of which—

Malaria fevers contributed.....	104
Acute diarrhea.....	1
All other causes.....	2

These patients were all returned to duty after a brief interval. The surgeon remarks: "These are for the most part typical fever and ague cases of the various types, such as are contracted in Cuba."

We have been able to trace 22 cases of typhoid fever admitted from the Eighth Ohio Infantry to the hospitals at Montauk Point, N. Y., between August 25 and September 15. These soldiers were infected in the island of Cuba. Amongst these 22 cases, 9 deaths are recorded.

Among the recruits of this regiment left at Camp Alger we have not been able to trace any cases of typhoid fever, nor have we been able to ascertain what number of recruits belonging to this regiment remained at Camp Alger.

No chart has been prepared for the Eighth Ohio Infantry.

SUMMARY.

Mustered into service at Columbus, Ohio, May 13, 1898.
 Arrived at Camp Alger, Va., May 19, 1898.
 No case of typhoid fever at State encampment.
 Did not import this disease into Virginia camp.
 No case of typhoid fever at Camp Alger, Va., but 1 case occurred on July 12, after the regiment's departure on July 5, thus pointing to infection at Camp Alger, Va.
 Number of cases of recognized typhoid fever for July, August, and September..... 23
 (Probable cases of typhoid fever not estimated).
 Total number of cases of recognized typhoid fever..... 23
 Number of deaths from recognized typhoid fever..... 9
 Per cent of mortality amongst cases of recognized typhoid fever 39.13
 Left Camp Alger, Va., July 5, 1898, for Cuba.
 Arrived at Santiago, Cuba, July 13, 1898.

EIGHTH PENNSYLVANIA VOLUNTEER INFANTRY.

Third Brigade, First Division, Second Army Corps.

[Abstract of surgeon's statement, Maj. C. E. Jouss, U. S. Volunteers.]

This regiment arrived at Camp Alger, Va., on May 18, 1898, from the State encampment at Mount Gretna, Pa.

The health of the men had been good. One case of typhoid fever, a member of Company A, was brought from Mount Gretna and was transferred to Fort Myer on May 20.

The Eighth, Twelfth, and Thirteenth Pennsylvania Volunteer Infantry were brigaded together as the Third Brigade, First Division, and occupied adjoining camp sites. While the general camp site was satisfactory, the three regiments were much crowded for space. Sinks were dug for the reception of excreta to a depth of less than 6 feet, as water was reached at a greater depth. These sinks were on a higher level than the location of the company tents. The water supply at first was obtained from springs and was insufficient. After a few weeks it was obtained from a driven well and was sufficient in quantity. But few cases of typhoid fever have occurred in the Eighth Pennsylvania Infantry to date (August 22).

REMARKS BY THE BOARD.

The sick report begins on May 13. In an average strength for May of 813 officers and men there were only 16 admissions to sick report, chiefly bronchial and pharyngeal affections. One case of intermittent fever, which lasted twenty-four hours, and 1 case of typhoid fever, were admitted. This case, admitted May 15, was sent to Fort Myer on May 20, where the diagnosis was confirmed.

For the month of June, in an average strength of 1,100, there were 53 admissions, as follows:

Acute diarrhea	11
Remittent fever	13
Intermittent fever.....	3
Typhoid fever.....	1
All other causes	25

The diarrheas were returned to duty within three days, except 1 case which lasted ten days.

The malarial diseases were of brief duration, except 1 case diagnosed as remittent fever admitted June 24, transferred to division hospital on June 25, and there pronounced to be a case of typhoid fever.

Two cases of typhoid fever thus occurred during June, as follows: Company A, June 25, 1 case, and Company G, June 29, 1 case.

The regiment occupying its same crowded camp site, we find for July, in an average strength of 1,106 officers and men, 75 admissions to sick report, as follows:

Acute diarrhea	5
Chronic diarrhea	1
Remittent fever	14
Intermittent fever.....	1
Typhoid fever.....	5
Diagnosis reserved.....	1
All other causes	48

The cases of diarrhea were of short duration, except the case of chronic diarrhea, which was sent to division hospital after nine days and furloughed.

Of the 15 cases diagnosed as malarial fever, 14 were treated by the regimental surgeon, and returned to duty as follows: One to four days, 10; five days, 1; fourteen days, 2; 1 was transferred to division hospital, where the diagnosis was changed to typhoid fever.

The case in which the diagnosis was reserved was transferred to Fort Myer and there diagnosed as typhoid fever. Two other cases of this disease not referred to in the regimental report were found at the division hospital and at Fort Myer. We thus find that 9 cases of typhoid fever developed in this regiment for the month of July, as follows:

Date.	Company.	Number of cases.
July 6.....	I.	1
11.....	E.	1
12.....	B.	1
12.....	K.	1
15.....	C.	1
24.....	K.	1
24.....	I.	1
27.....	A.	1
29.....	A.	1
Total		9

The cases of fourteen days' duration, diagnosed as malarial fever, 1 in Company G, beginning July 9, and 1 in Company K, beginning July 9, were probably mild cases of typhoid infection.

During the first week in August this regiment moved to a new and more roomy camp site near Dunn Loring, Va. In a strength of 1,103 officers and men we find 199 admissions to sick report, as follows:

Acute diarrhea	12
Acute gastritis	1
Intermittent fever	8
Malarial fever	18
Remittent fever	58
Typhoid fever	27
All other causes	75

Nine cases of acute diarrhea were treated in quarters and were of short duration, only 1 lasting seven days. One case was furloughed after two days' treatment in quarters and not returned to duty till nearly three months later. Two cases of diarrhea were sent to First Division Hospital, where both were changed to malarial fever and furloughed after two days' treatment.

The case of acute gastritis was transferred to First Division Hospital, changed to intermittent fever, and furloughed after two days.

Of the cases diagnosed as intermittent fever, 3 were treated in quarters and were of the following duration: Four days, 1; five days, 1; nine days, 1. Two cases were furloughed after three days; 1 of these was not returned to duty until three months later; the other could not be traced. Three cases were sent to division hospital; 1 died three days after admission of catarrhal pneumonia; 1 was changed to wryneck, and 1 returned to regiment after two days, without diagnosis.

Of the 18 cases of malarial fever, 10 were treated in quarters and were of less than two days in duration. Four cases were sent to division hospital, where 1 was changed to acute rheumatism and 3 furloughed as remittent fever after three days' treatment. One case was sent to Fort Myer and there diagnosed as typhoid fever. Three cases sent to division hospital were returned to the regiment after thirty-one to thirty-five days, diagnosis unchanged.

Of the 58 cases diagnosed as remittent fever, 34 were treated in quarters, as follows: To duty after one to five days, 30; eight days, 1; nine days, 1; eleven days, 1; eighteen days, 1. We here note that 2 of the cases returned to duty within four days were readmitted three days later and transferred to the hospital train as cases of typhoid fever. Sixteen cases were transferred to the First Division Hospital, of which 4 were changed to typhoid fever, 1 to malarial orchitis, 1 to acute coryza, 3 to remittent fever (of which 2 went to duty after four to nine days), 1 to Pennsylvania Hospital, and 7 could not be traced. Eight were furloughed, of which 1 was returned to duty after sixty days, and 7 could not be traced.

We also find 2 cases of typhoid fever admitted for

August, in which the diagnosis was changed from that given in the regimental report for the same month, as follows: Acute gastritis in 1 case, and remittent fever in another.

In addition, therefore, to the 27 cases of typhoid fever reported by the regimental surgeon, we have traced 7 cases of supposed malarial fever changed to typhoid fever and 2 additional cases in other hospitals, making a total of 36 cases for August, as shown in the following table:

Date.	Company.										Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	
August 1										1	1
2				1							1
3								1			1
4		1									1
5											
6											
7											
8	1				1	1			1		4
9			1								1
10											
11									1		1
12											
13			1				1		1		3
14											
15							1				1
16											
17						1	1				2
18											
19			1					1			2
20								1			1
21											
22			1					1			2
23						5			1		6
24	1		1	1					1		4
25				1	1	1					3
26						1					1
27							1				1
28											
29											
30											
31											
Total	2	1	5	3	2	10	4	3	3	3	36

This number, we feel sure, does not represent the full prevalence of typhoid fever in this regiment during August. Besides the cases of supposed malarial infection transferred to division hospital or furloughed, concerning which we have been unable to obtain any record, there were 3 cases of malarial fever returned to duty after thirty-one to thirty-five days' treatment in hospital. The latter were probably cases of typhoid fever.

Again, the case of supposed intermittent fever, furloughed on third day of treatment, and not returned to duty until three months later, as well as the case of the same disease dying of catarrhal pneumonia three days after admission to hospital, should, we think, be considered as cases of typhoid fever. With these added the cases of typhoid fever would number 40, which, we think, also falls below the real number for August. It will be seen that the surgeon's claim that only 18 cases of typhoid fever had occurred in this regiment to August 22 can not be substantiated. Had he followed his cases to division hospital he would have found a larger number, and thereby ascertained that his regiment was not an exception to the general prevalence of typhoid fever in the Third Brigade.

The Eighth Pennsylvania Volunteer Infantry was transferred by rail from Camp Alger, Va., to Camp Meade, Pa., on August 30.

In an average strength for the month of September of 1,093 officers and men, we find 134 admissions to sick report, divided as follows:

Acute diarrhea	9
Gastric catarrh	3
Gastroenteritis	1
Intermittent fever	6
Malarial fever	28
Remittent fever	15
Typhoid fever	7
All other causes	65

Of the cases of diarrhea, 7 were treated in quarters and were of less than three days' duration; 2 cases were sent to division hospital and could not be traced.

The 3 cases of gastric catarrh were sent to hospital, where 1 was changed to typhoid fever and 2 could not be traced.

The case of gastroenteritis was furloughed.

Four of the cases diagnosed as intermittent fever were treated in quarters, and returned to duty after two days in three cases, and eighteen days in one case. Two cases of supposed intermittent fever were furloughed after six days, and were not returned to duty until eighty and eighty-two days later.

Twenty-two cases diagnosed as malarial fever were treated in quarters and returned to duty, as follows: After three days, 15; seven days, 7; 4 cases were furloughed and not returned to duty after thirty days; 2 were sent to division hospital, where 1 was changed to typhoid fever, and 1 could not be traced.

Of the 15 cases diagnosed as remittent fever, 6 were returned to duty within 3 days; 1 was sent to division hospital, the diagnosis being changed to typhoid fever, and 8 were furloughed. Of the latter, 5 were returned to duty after thirty, thirty-five, thirty-eight, forty-four, and sixty-nine days, respectively.

In addition to the 7 cases diagnosed as typhoid fever by the regimental surgeon, we find in the First Division Hospital 1 case of "myalgia, acute," and 1 case of tonsillitis changed to typhoid fever; also 4 cases of typhoid fever which do not appear on the regimental reports. A case is also found in the Medico-Chirurgical Hospital, Philadelphia, admitted from Company E, Eighth Pennsylvania, on September 3. Thus we have, for the month of September, 17 cases of typhoid fever, as follows:

Date.	Company.										Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	
September 4.....					1	1		1			3
5.....				1							1
6.....						1	1				2
7.....								1			1
8.....		1									1
9.....	1										1
13.....										1	1
14.....	1	1									2
15.....				1							1
20.....		1									1
24.....				1							1
25.....			1								1
26.....							1				1
Total.....	2	3	1	3	1	2	2	2	0	1	17

It will be observed that 12 of the cases occurred during the first half of the month, thus pointing to infection prior to leaving Camp Alger. Could the furloughed cases have been traced, other cases of typhoid fever would probably have been found among these. We call attention here to the 2 cases of intermittent fever furloughed and not returned to duty until nearly three months had elapsed. The marked reduction in the cases for September is, therefore, more apparent than real.

During the succeeding month of October the regiment remained at Camp Meade, Pa. In an average strength of 1,080 officers and men there were 101 admissions to sick report, as follows:

Intestinal disorders.....	10
Intermittent fever.....	2
Malarial fever.....	30
Typhoid fever.....	18
All other causes.....	41

The intestinal disorders and intermittent fevers were short in duration, except 1 case of acute gastritis, which was sent to hospital and changed to typhoid fever.

Twenty-seven cases of malarial fever were treated in quarters and returned to duty after two to six days' treatment. One case was furloughed and returned to duty after twenty-six days, and 2 cases were sent to division hospital and changed to typhoid fever. We also find 2 additional cases of typhoid fever in the First Division Hospital which are not included in the surgeon's statement for October. The surgeon's diagnoses of typhoid fever were all confirmed. The following are the cases of typhoid fever, by company and date, for October:

Date.	Company.										Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	
October 1.....	1						1				2
6.....		1									1
7.....								1			1
8.....							1				1
9.....				1							1
13.....		1									1
15.....	1										1
17.....			1				1				2
18.....				1							1
19.....				1							1
23.....	1								1		2
25.....							1				1
26.....				1	2						3
29.....	1							1			2
30.....	1										1
31.....				1						1	2
Total.....	5	2	1	5	2	0	4	2	0	2	23

The regiment remained at Camp Meade, Pa., until November 13, 1898, when it was transferred to Camp McKenzie, Augusta, Ga. The health of the men for this month was very good.

Average strength for November, 1,065, with 62 admissions, as follows:

Acute gastritis	3
Malarial fever.....	3
Remittent fever	8
Typhoid fever	2
Other causes	46

The cases of gastritis and malarial and remittent fever were returned to duty after a few days' treatment, except 1 case of remittent fever transferred to hospital at Lancaster, Pa., and which has not been traced.

The diagnoses in the 2 cases of typhoid fever were confirmed, and a third case was reported from the division hospital. Company C, November 2, 1 case; Company H, November 6, 1 case; Company K, November 8, 1 case.

For December, 1 remittent, lasting five days, was reported. No case of typhoid fever occurred.

Reviewing the development of typhoid fever in this regiment, it will be seen that the regiment, mustered in during the early part of May, arrived at Camp Alger, Va., on May 18, importing 1 case of typhoid fever; that a second and third case did not develop till June 25 and 28; that notwithstanding its crowded camp site only 9 additional cases occurred during the month of July, affecting six companies, while four companies had no cases; that its removal to a new camp site in August did not serve to eradicate the disease, a few cases continuing to occur in all companies, while one company, F, had as many as 10 cases during this month; that a second removal of the regiment, this time to another State, on August 30, did not serve to arrest the development of cases during the following months of September and October in spite of the adoption of very stringent sanitary measures in the new camp and a pure water supply.

SUMMARY.

Mustered into service at Mount Gretna, Pa., early in May, 1898.

Arrived at Camp Alger, Va., May 18, 1898.

Had 1 case of recognized typhoid fever at State camp.

This case was imported into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, Va., June 25, 1898.

Typhoid fever in the Eighth Pennsylvania Volunteer Infantry, by months.

	May.	June.	July.	August.	September.	October.	November.	Total.
Recognized cases.....	1	2	9	36	17	23	3	91
Probable cases.....								10
Total.....	1	2	9	36	17	23	3	101

Total cases of recognized typhoid fever.....	91
Total cases of probable typhoid fever.....	10

Total cases of recognized and probable typhoid fever..	101
Number of deaths from recognized typhoid fever.....	8
Per cent of mortality among recognized cases of typhoid fever..	8.79
Per cent of mortality among recognized and probable typhoid-fever cases.....	7.92

Left Camp Alger, Va., August 30, 1898, for Camp Meade, Pa.

Left Camp Meade, November 13, 1898, and transferred to Camp McKenzie, Augusta, Ga.

TWELFTH PENNSYLVANIA VOLUNTEER INFANTRY.

Third Brigade, First Division, Second Army Corps.

[Abstract of brigade surgeon's statement—Major Parke, U. S. Volunteers.]

The regiment was mustered into service at Mount Gretna, Pa., about the 10th of May, 1898. It arrived at Camp Alger, Va., May 19, 1898.

No case of typhoid fever was brought with the regiment. The first case occurred on June 26, in Company D, the soldier dying at Fort Myer on July 4.

The remarks as to camp site and sanitary arrangements already made in the case of the Eighth Pennsylvania Infantry will apply to this regiment. Water was obtained during the first three or four weeks from a surface spring and was quite insufficient.

To date (August 20) there have been 84 cases of typhoid fever, with 10 deaths. Thirty cases have occurred in one company, G, with 5 deaths. The company consists of men of means, who receive boxes of food frequently from home and have money with which to buy extra articles of food. Company G had its own private well. This well was about 16 feet in depth and was dug the first week after arrival at Camp Alger. Other companies were not permitted to draw water from this well. Its location was between the kitchen and the kitchen sink. There was a privy within 50 feet of the well. According to the surgeon's recollection, the outbreak occurred about two weeks after the completion of this well. The outbreak in the company was sudden, 2 or 3 cases for several days in succession.

The regiment was given a new camp site on August 2, near Dunn Loring, Va., with the result of reducing the number of cases of typhoid fever in Company G and in the regiment as a whole.

Concerning the general origin of typhoid fever in the Pennsylvania brigade at Camp Alger, Major Parke stated that there were numerous "shacks" near by, at which all manner of summer drinks could be purchased, and that much of the water used in washing the glasses and dishes of these vendors was obtained from the open ditches. He had complained to the brigade commander, who had tried to have them abolished, without success. Possibly in this way men became infected.

REMARKS BY THE BOARD.

The first entry on sick report is made on May 21, after the regiment had arrived at Camp Alger. During the last ten days in May, in an average strength of 640 officers and men, there were 41 admissions, divided as follows:

Diarrhea.....	5
Intermittent fever.....	10
Remittent fever.....	2
Typhoid fever.....	0
Other causes.....	24

No case was under treatment more than four days.

Average strength for June, 888; admissions, 54, as follows:

Diarrhea.....	16
Remittent fever.....	13
Typhoid fever.....	1
All other causes.....	24

The cases of diarrhea varied in duration from one to five days.

Ten cases of remittent fever, treated in quarters, were of the following duration: Two days, 3; five days, 2; six days, 1; ten days, 1; seventeen days, 1. Of 2 cases transferred to division hospital, 1 could not be traced; the other case, however, was sent to Fort Myer and changed to the diagnosis of typhoid fever. The case of supposed remittent fever transferred to hospital was admitted on June 30 (Company F).

The case of typhoid fever, diagnosed by the regimental surgeon, was admitted on June 26, transferred to Fort Myer June 27, and died July 4. Thus, for the month of June, 2 cases of typhoid fever developed in the regiment, viz, Company D, June 26, 1 case, and Company F, June 30, 1 case.

The case of supposed remittent fever reported as sent to hospital on June 27 from Company G and not further traceable was probably a third case of typhoid fever.

The regiment occupied its same camp site during July. Strength, 888; admissions to sick report, 156, divided as follows:

Acute diarrhea.....	14
Acute gastritis.....	11
Remittent fever.....	55
Gastro-enteric fever.....	2
Typhoid fever.....	6
All other causes.....	68

Of the 14 cases of diarrhea, 12 were treated in quarters and returned to duty as follows: After three days, 3; four to six days, 5; nine days, 2; nineteen days, 1, while in 1 case no record of the termination is given. One case of diarrhea was furloughed, and died at Williamsport, Pa., of typhoid fever, and 1 case was transferred to Fort Myer and diagnosed as typhoid fever. We note that 25 per cent of the cases of diarrhea were confined to Company G, and that both cases in which the diagnosis was changed to typhoid fever belonged to that company.

Of the cases diagnosed as acute gastritis, 8 were treated in quarters and returned to duty as follows: After three days, 3; five to eight days, 5; 2 cases were transferred to hospital, and in both the diagnosis was changed to typhoid fever. One case could not be traced. We note that 3 of the 11 cases belonged to Company G.

Of the 55 cases diagnosed as remittent fever, 23 were treated in quarters and were of the following duration: One day, 1; four to seven days, 7; eight to ten days, 5; fifteen days, 1; remaining under treatment August 31, after periods varying from thirty-two to fifty-one days, 9. Six cases were furloughed after five to eighteen days' treatment in quarters and could not be traced.

Twenty-six cases were transferred to division hospital and to Fort Myer. In all of these cases the diagnosis was changed to typhoid fever. We note that 29 of the 55 cases diagnosed as remittent fever occurred in Company G. Twenty of these were changed to typhoid fever.

Two cases diagnosed as gastro-enteric fever were transferred to hospital and changed to typhoid fever. One of these belonged to Company G.

In addition to the foregoing cases we find admitted to the general hospital at Fort Myer during July 9 cases of typhoid fever whose names are not borne upon the regimental or division hospital reports. We also find that a case of acute muscular rheumatism, admitted July 22 from Company A and transferred to Fort Myer, was changed to typhoid fever, the soldier dying on August 7. We are thus able to trace 45 cases of typhoid fever in this regiment for the month of July, as follows:

Date.	Company.								Total.
	A.	B.	C.	D.	E.	F.	G.	H.	
July 2.....	1								1
4.....				1					1
5.....						1			1
7.....				1					1
8.....				1					1
11.....				1				1	2
13.....					1				1
16.....								1	1
17.....							3		3
20.....							1		1
21.....							3		3
22.....	2						3		5
23.....						1	2		3
24.....							1	1	2
25.....						1	2	1	4
26.....	1						1		2
27.....							1	1	2
28.....							2		2
29.....							2		2
31.....	1	1					5		7
Total.....	5	1	0	4	1	3	26	5	45

This table, however, does not represent the full prevalence of typhoid fever for July. It certainly falls short in the number of cases occurring in Company G. Cases originating on the following dates and furloughed under the diagnosis of remittent fever after ten to fourteen days' treatment should, we think, be added to its typhoid-fever list, viz: July 16, 1 case, and July 23, 3 cases. Also cases remaining under treatment in quarters August 31, which were admitted to sick report as follows: July 23, 1 case, July 28, 1 case, and July 31, 2 cases. Thus making a total of 34 cases occurring in this one company.

The following companies should be credited with additional cases of probable typhoid fever, admitted as cases of remittent fever and treated by the surgeon for periods varying from thirty-two to fifty-one days, and not yet returned to duty, viz:

Date.	Company.	Number of cases.
July 5.....	F	1
6.....	B	1
10.....	D	2
19.....	H	1
22.....	A	1
26.....	A	1
29.....	H	1
Total.....		8

Thus we find 45 cases of recognized typhoid fever in the Twelfth Pennsylvania Volunteer Infantry for July, and 16 probable cases of this disease, making a total of 61 cases, distributed as follows:

Company.	Number of cases.
A.....	7
B.....	2
C.....	0
D.....	6
E.....	1
F.....	4
G.....	34
H.....	7
Total.....	61

Taking this number as approximately correct, we find that of 11 cases occurring up to the 15th of July none had occurred in Company G, whereas of the 50 cases occurring during the latter half of the month 34 were confined to this company. This would appear to point to some particular source of infection for G Company.

Attention at once turns to the shallow well owned by this company, and from the use of whose water the other companies were said to have been excluded. Considering this well as a probable source of infection, its water seems to have escaped contamination from the time of its construction during the latter part of May until the first week in July, as G Company's epidemic did not begin until July 17.

While this well was liable to infection at any time from the battalion privy, located about 50 feet away, we have already pointed out that the first cases of typhoid fever to occur in this regiment after its arrival at Camp Alger were on June 26 and 30. The chances for the possible infection of the contents of the privy were afforded, therefore, at that time and subsequently. We also observe that, contrasted with the dry weather during the first week in June, there was a rainfall of 0.35 of an inch on June 25, 0.80 of an inch on June 28 and 29, and 0.35 of an inch on July 5 and 6. The conditions, therefore, seem to have been favorable for the contamination of this well with typhoid dejecta about the first week in July, allowing a few days for seepage through the intervening soil.

It was a matter of regret to the board that the exact location of this well could not be ascertained at the time of the board's visit to Camp Alger, although earnest effort was made in this direction. The old camp site having been abandoned some four weeks earlier, all landmarks had already disappeared and the site of the well was thoroughly obliterated. Nevertheless, from evidence before us and from the course of the outbreak we are of the opinion that its own private water supply was the source of the infection in Company G.

It is important to observe, as bearing on the occur-

rence of milder typhoid infections, that in addition to the 2 cases of acute diarrhea in this company in which the diagnosis was changed to typhoid fever there were 4 other cases of diarrhea, as follows: July 15, 1 case, duration six days; July 25, 2 cases, duration nine days each, and July 29, 1 case, duration five days.

Of cases diagnosed as acute gastritis there were 3, viz: July 23, 1 case, duration five days; July 26, 1 case, duration not stated, and July 27, 1 case, duration not stated.

Of milder fevers occurring in this company during the typhoid fever epidemic there were 4 cases, as follows: July 21, 1 case, duration eight days; July 23, 1 case, duration five days; July 26, 1 case, duration ten days; July 31, 1 case, duration six days.

In other words, in addition to the 34 cases of prolonged fever, there were during the same period 11 milder infections, diagnosed as diarrhea, gastritis, or remittent fever, as compared with 1 case of diarrhea of two days' duration, recorded in this company for the first fifteen days of the month. Company G's private well was filled in soon after the outbreak began—that is, between the 17th and 25th of July. It has not been possible to obtain the exact date of the abandonment of this well, except in a rough way, as first mentioned. If the use of the water from this well has been responsible for the epidemic in the company, and if the well were closed between the dates mentioned, then we should expect a marked reduction some time between the 1st and 10th of August.

Concerning the record, we find the admissions for this company for August as follows: August 2, 2 cases; August 5, 2 cases; August 9, 1 case; August 22, 1 case, and August 25, 1 case; thus pointing to this well as the probable source of the outbreak.

On August 2 the Twelfth Pennsylvania Infantry was moved from its crowded camp site, which it had occupied for two months and fourteen days, and went into a new camp on an elevated and sloping piece of ground near Dunn Loring, Va. The regiment was well separated from other organizations; its water was obtained from a driven well which furnished an abundant supply, and every care was taken as to the sanitary condition of the camp. Sinks for excreta were located at the bottom of the incline, and each man was made to cover his stool with earth as soon as deposited. Upon leaving the latrine each soldier was required to wash his hands with soap and water before returning to the company street. These regulations were carefully carried out under the supervision of a sentinel posted at each latrine for this purpose.

At the time of the board's inspection (August 23) the general sanitary condition of this camp was very good.

The regiment having been established in its new

camp on August 2, we find for this month, in an average strength of 877 officers and men, 171 admissions, divided as follows:

Acute diarrhea.....	2
Malaria.....	27
Remittent fever.....	85
Continued fever.....	1
Typhoid fever.....	26
All other causes.....	30

Of the 2 cases of diarrhea, 1 was changed to remittent fever and furloughed after six days; the other case could not be traced.

Of the 27 cases diagnosed as malaria, 26 were treated by the surgeon in quarters, with the following result: Returned to duty within seven days, 14; eight to ten days, 2; furloughed after three to nine days, 3; while in 7 cases admitted during the last week in August no termination is given. One case of malaria was transferred to hospital and changed to typhoid fever.

Of the 85 cases diagnosed as remittent fever, 43 were treated in quarters, of which 21 were furloughed within one to five days and 1 after thirteen days' treatment; 9 were returned to duty after four days; 2 within fourteen days; 1 changed to rheumatism and furloughed, and 9, taken sick within the last week of July, had no termination given. Forty-two cases diagnosed as remittent fever were transferred to division and general hospitals; of these 5 were returned to the regiment within seven days, with diagnoses unchanged; 2 were changed to heat prostration; 1 to acute diarrhea; 13 were changed to the diagnosis of typhoid fever, and 21 could not be traced.

The case of continued fever was transferred to hospital and changed to typhoid fever.

Of the 26 cases diagnosed by the regimental surgeon as typhoid fever, 8 were furloughed within three days and could not be further traced; 18 were transferred to hospital, of which 1 was changed to quinsy; 1 returned to duty after three days without diagnosis; 1 could not be traced, and in 15 cases the diagnosis was confirmed.

It will be seen that it is impossible to accurately approximate the prevalence of typhoid fever in this regiment during August, owing to the number of furloughs given, especially during the latter half of the month, for supposed malarial and typhoid fevers. Not less than 33 men were furloughed for these causes within the first week of their illness, generally within three days from the beginning of the attack. In 16 other cases no termination is given to the attack, while in 9 additional cases the hospital records fail to show that the cases ever reached the hospital. While some of these were undoubtedly typhoid fever, the majority, we think, can be ascribed to other causes. The following table gives the undoubted cases of typhoid fever occurring during August, with company and date:

Date.	Company.								Total.
	A.	B.	C.	D.	E.	F.	G.	H.	
August 1.....		1	1					1	3
2.....	1						2		3
3.....								1	1
4.....		1							1
5.....							2	3	5
6.....		1							1
9.....					1		1		2
11.....		1							1
12.....	1	1							2
13.....			1			1			3
14.....			1						1
15.....	1	1		1					3
17.....		1			1				2
19.....								1	1
21.....			2						2
22.....							1		1
23.....		1							1
25.....		2	2		2		1	1	8
Total.....	3	10	7	1	5	1	7	7	41

In connection with the occurrence of typhoid fever by companies as shown in the foregoing table, we here refer to the number of men furloughed during August from the several companies for supposed malarial and typhoid fevers as follows:

Date.	Company.	Number of cases.
August 18.....	A.	2
August 8.....	B.	1
August 4, 10, 18, and 21.....	C.	5
August 15 and 23.....	D.	4
August 7, 9, 17, 18, 21, 22, and 25.....	E.	9
August 12, 13, 15, 16, 21, and 31.....	F.	6
August 5 and 9.....	G.	3
Total.....		30

It will also be seen that the number of cases of typhoid fever and the number of furloughs markedly decrease after the third week in August. This decrease we believe to have been influenced by the change of camp site on August 2, as well as by the strict sanitary measures enforced by the regimental authorities. That these did not suffice to stamp out the disease entirely will be seen by an examination of the records of the First Division Hospital at Camp Meade, Pa., to which point the regiment was transferred on August 29, 1898.

No regimental report later than that for August is available for study.

The following table gives the cases of typhoid fever for September, as shown by the records of the First Division Hospital, Camp Meade, and of the Pennsylvania State hospitals:

Date.	Company.								Total.
	A.	B.	C.	D.	E.	F.	G.	H.	
September 1.....					1	1	1	1	4
2.....	1	1	1						3
3.....		1					1		2
4.....		1							1
5.....						2			2
7.....			1	1			1		3
8.....	1		1						2
9.....	1								1
10.....									0
13.....	1								1
Total.....	4	3	3	1	1	4	2	1	19

We also find in the division hospital, admitted during the first week in September, 4 cases of supposed malarial fever; all furloughed after two to seven days in the hospital.

The regiment left Camp Meade, Pa., on September 19, 1898, under orders to be mustered out of the service. Only one case of typhoid fever is recorded during the last ten days of the regiment's stay at this camp.

Reviewing the progress of typhoid fever in this organization, we find that the regiment, having been mustered into service about May 10, reached Camp Alger, Va., from its State camp on May 19, not importing any case of typhoid fever; that 2 cases developed on June 26 and 30; that up to the middle of July, 8 other cases had occurred, affecting five different companies; that beginning with July 17, an outbreak occurred in Company G, probably due to infection of a shallow well, amounting to 26 cases for the month, while for the same period the remaining seven companies only furnished 10 cases; that notwithstanding a change of camp site made on August 2, 41 cases are recorded for this month, and 16 cases for the period September 1 to 13, following a second change of camp to Middletown, Pa., on August 31. The course of the disease in this regiment, excepting the outbreak in Company G, was such as to exclude any contamination of the general water supply.

SUMMARY.

Mustered into service at Mount Gretna, Pa., May 10, 1898.

Arrived at Camp Alger, Va., May 19, 1898.

No case of typhoid fever in State camp.

No case of typhoid fever imported into Virginia camp.

Date of first case of typhoid fever after arrival at Camp Alger, Va., June 26, 1898.

Typhoid fever in the Twelfth Pennsylvania Volunteer Infantry, by months.

	June.	July.	August.	September.	Total.
Recognized cases	2	45	41	19	107
Probable cases					16
Total	2	45	41	19	123

Total number of recognized cases of typhoid fever..... 107

Total number of probable cases of typhoid fever..... 16

Total number of recognized and probable cases of typhoid fever

123

Number of deaths from recognized typhoid fever..... 23

Per cent of mortality among recognized cases of typhoid fever

21.49

Per cent of mortality among recognized and probable cases of typhoid fever.....

18.69

Left Camp Alger August 29, 1898, by rail for Camp Meade, Pa.

THIRTEENTH PENNSYLVANIA VOLUNTEER INFANTRY.

Third Brigade, First Division, Second Army Corps.

[Abstract of surgeon's statement—Maj. W. A. Keller, U. S. Volunteers.]

The regiment was assembled at Scranton, Pa., from which point it went to Mount Gretna, Pa., on April 28, 1898.

During the three weeks that it was in the latter camp the sick report was very small. There was no case of typhoid fever.

The regiment arrived at Camp Alger, Va., on May 19, and was placed in camp between the Eighth and Twelfth Pennsylvania Infantry. The only water supply was obtained from a small spring, down the hill beyond the Twelfth Regiment. As the spring was shallow and the surface drainage could reach it, a barrel was sunk and cracked stones placed in and around it. This spring was used for four to six weeks. The Fourth Missouri Volunteer Infantry went into camp about one week after the Thirteenth Pennsylvania arrived, and was located on higher ground than this spring and only about 100 yards distant from it. This regiment had 2 cases of typhoid fever.^a An official complaint was promptly lodged with the War Department against the water supply, and while waiting for a well to be sunk by the Department the regiment constructed a well of its own, located on high ground and about 200 yards distant from the Fourth Missouri's camp site. This well was about 18 feet in depth and at least 100 yards from the regimental sinks and on higher ground. This water was largely used for cooking purposes. During the latter part of June water was obtained from a driven well and was used in common with the Twelfth Pennsylvania Infantry.

June 23 and 24 the regiment went on a practice march to Cabin John Bridge and return, the men drinking water along the line of march wherever it could be obtained.

The first case of typhoid fever appeared on July 2. Thirteen other cases of typhoid fever occurred during the month.

A second march to the Potomac and return was made on July 12.

The regiment vacated its first camp site on July 18 and went into a second camp near Dunn Loring, Va. No cases of typhoid fever appeared between July 31 and August 9. From that date to the present time

^aThis is an error.—W. R.

(August 23) 5 cases have occurred, bringing the total up to 19 cases, with 4 deaths.

No cases of malarial remittent fever occurred in the first, but about 25 cases have occurred in the second camp. In the latter camp water has been hauled in barrels from various sources, pending the sinking of a deep well, which has just been completed (August 23).

The Thirteenth Pennsylvania Volunteer Infantry has been as badly treated in the matter of its water supply as any regiment at Camp Alger, being compelled to use water during May and the greater part of June from a shallow surface spring, and July 18 to August 23 from any source available. It has been largely obtained during this time from the wells of the Third Virginia Infantry and First Connecticut Infantry. The drinking water has not been boiled at any time.

Major Keller did not attribute the occurrence of typhoid fever in his regiment to the water supply, but rather to the abominable drinks of all descriptions furnished by the proprietors of shacks. These venders were not permitted to use the deep-well water, and hence resorted to all manner of expedients in obtaining water, such as from an old abandoned well near the division headquarters. It was reported that they used ditch water to cleanse their dishes and utensils. It was impossible to prevent the men from wandering over the surrounding country and obtaining water from various sources.

REMARKS BY THE BOARD.

For the period May 13 to 31, in an average strength of 36 officers and 604 enlisted men, there were 47 admissions to sick report, as follows:

Acute diarrhea	7
Intermittent fever	1
Typhoid fever	0
Other causes and injuries	39

The diarrheas were promptly returned to duty, except 1 case of twelve days' duration.

For June, in an average strength of 36 officers and 856 enlisted men there were 199 admissions. Concerning this large number Maj. C. R. Parke, regimental surgeon, states that the majority are due to vaccination and diarrhea. He notes the occurrence of several cases of typhoid fever in the Third Brigade, First Division, Second Army Corps, and recommends that drinking water should be boiled.

The causes of admissions were divided as follows:

Acute Diarrhea	97
Acute dysentery	1
Cholera morbus	6
Malarial fever	0
Typhoid fever	1
Other causes (largely vaccinia)	94

All cases of intestinal disorders were mild in character and soon returned to duty, except the case of dysentery which was transferred to Fort Myer.

The case of typhoid fever dated from June 20, and

was an officer of Company C. Diagnosis was confirmed at Fort Myer.

The health of this regiment was, therefore, very satisfactory from May 19 to June 30, notwithstanding its varied water supply and crowded camp site. Diarrhea was prevalent during June, all companies being about equally affected.

The regiment continued to occupy the same camp site till July 18. Average strength for July: Officers, 36; enlisted men, 842; admissions, 171, divided as follows:

Acute diarrhea	51
Dysentery	2
Ephemeral fever	7
Malarial fever	4
Typhoid fever	15
All other causes	92

The cases of intestinal disease were all mild in character.

The fevers, ephemeral and malarial, were soon returned to duty, except 1 case of the former and 1 case of the latter, which were transferred to Fort Myer and changed to typhoid fever.

In addition to the 15 cases of typhoid fever, in all of which the diagnosis was confirmed at Fort Myer, 2 cases of influenza which were transferred to Fort Myer general hospital were changed to typhoid fever and 1 changed to typhoid fever in division and other hospitals. We thus find 20 cases of this disease in the Thirteenth Pennsylvania Infantry during July, as follows:

Date.	Company.								Total.
	A.	B.	C.	D.	E.	F.	G.	H.	
July 2				1					1
4								1	1
6		1							1
8				1					1
9					1				1
10		1		1			1		3
14	1								1
16		1							1
17						1			1
21							1		1
22			1						1
25						1		1	2
28	1								1
30				1		1		1	3
31							1		1
Total	2	3	1	4	1	3	3	3	20

The regiment being established in its new camp on July 18, we find in an average strength for August of 31 officers and 839 enlisted men 214 admissions to sick report from all causes, divided as follows:

Acute diarrhea	38
Acute dysentery	3
Ephemeral fever	20
Malarial fever	18
Typhoid fever	7
All other causes	128

The intestinal disorders were returned to duty within a week, except 2 cases furloughed and changed to insolation and 1 case of dysentery transferred to a Philadelphia hospital. This case was later changed to typhoid fever.

Nine cases of ephemeral fever were treated in quarters; 6 cases being returned to duty within four days; after six days, 1; seven days, 1; nine days, 1. Six cases were furloughed after being under treatment from three to eleven days and could not be traced; 3 transferred to division hospital, of which 2 were changed to typhoid fever. Two cases were sent to Philadelphia hospitals, where both were changed to the diagnosis of typhoid fever.

Of the 18 malarial fevers, 6 were treated in quarters and returned to duty after two, three, six, seven, and nine days; 11 were sent to division and other hospitals, of which 3 were changed to typhoid fever and 8 could not be traced. One case of supposed malarial fever was sent to Garfield Hospital, Washington, D. C., and was there changed to typhoid fever.

In addition, therefore, to the 7 cases diagnosed by the regimental surgeon we find 1 dysentery changed to typhoid fever, 4 ephemeral fevers changed to typhoid fever, 4 malarial fevers changed to typhoid fever, making in all 16 cases for the month of August, as follows:

Date.	Company.									Total.
	A.	B.	C.	D.	E.	F.	G.	H.	Staff.	
August 10.....									1	1
12.....		1								1
13.....							1			1
15.....			1		1					2
18.....	1	1								2
21.....			2				1			3
22.....							1			1
23.....			1	1						2
25.....			1				1		1	3
Total.....	1	2	5	1	1	0	4	1	1	16

The regiment having changed station to Camp Meade, Pa., on August 31, we find for September, in an average strength of 36 officers and 827 enlisted men, 162 admissions, as follows:

Acute diarrhea.....	18
Ephemeral fever.....	13
Malarial fever.....	30
Typhoid fever.....	12
All other causes (largely bronchial and nasal catarrh).....	89

Of the diarrheas, 13 were treated in quarters and returned to duty within six days; 5 were sent to division hospital, where 3 were furloughed as remittent and 2 changed to typhoid fever.

Two cases of ephemeral fever treated in quarters were of brief duration (three days). Of 11 cases sent to hospital, 3 could not be traced and 8 were changed to typhoid fever.

Twenty-two cases diagnosed as malarial remittent were returned to duty as follows: One to four days, 14; five to seven days, 6; ten to thirteen days, 2. Of 8 cases sent to division hospital, 4 were changed to typhoid fever, 2 to remittent fever, and 1 to acute gastritis and furloughed after 10 days.

One case of influenza transferred to hospital was changed to typhoid fever.

Six cases of typhoid fever were found in hospitals and not accounted for by the regimental surgeon.

Thus, to the 12 cases of typhoid fever diagnosed by the surgeon and confirmed, we find in addition the following diagnoses changed to that disease:

	Cases.
Diarrhea.....	2
Ephemeral fever.....	8
Malarial fever.....	4
Influenza.....	1
Not accounted for.....	6
Total.....	21

making a total of 33 cases for September, as follows:

Date.	Company.									Total.
	A.	B.	C.	D.	E.	F.	G.	H.	Staff.	
September 1.....				1	3					3
2.....				1			1			3
3.....	2		1		1					4
4.....					1					1
5.....			1				1			2
6.....						1			1	2
7.....				1						1
8.....					1					1
11.....		1								1
14.....			1							1
15.....	1		1							2
16.....								2		2
20.....			1							1
22.....	1		1							2
23.....	2									2
24.....	1							1		2
26.....				1						1
27.....			1							1
28.....				1						1
Total.....	7	1	9	3	6	1	4	1	1	33

Eighteen of these cases, occurring within eleven days of arrival at Camp Meade, Pa., may be considered as infections at Camp Alger, Va.

The same camp having been occupied during October, the surgeon remarks on the sick and wounded report that "the health of this command during the month has shown a decided improvement; typhoid fever is being gradually stamped out, malarial fever is on the increase, but the cases are not of a very severe type."

Average strength for October: Officers, 25; enlisted men, 654. Admissions, 146, as follows:

Acute diarrhea.....	13
Malarial fever.....	51
Typhoid fever.....	8
Convalescent from typhoid fever.....	4
Other causes.....	70

Twelve cases of diarrhea treated in quarters were of short duration, except two cases lasting fifteen to nineteen days. One case was sent to division hospital and transferred to a Philadelphia hospital the following day and could not be further traced.

Thirty-five cases diagnosed as malarial fever were treated in quarters, 32 of these lasting less than five days; seven to nine days, 2, and seventeen days, 1. This case was complicated with diarrhea. Fifteen cases of malarial fever were sent to division hospital, of which 5 were furloughed as remittent fever after two to twenty days' treatment, 5 transferred to other hospitals as remittent or intermittent fever, and 5 changed

to the diagnosis of typhoid fever. Of the cases transferred to other hospitals as malarial fever, 2 cases diagnosed as intermittent fever have been traced and found changed to typhoid fever.

The cases diagnosed as typhoid fever were confirmed.

The 4 cases of typhoid-fever convalescents have been already accounted for during August and September. One case of typhoid fever was found in the Second Division Hospital, Second Army Corps, and 5 cases in Pennsylvania hospitals not accounted for on the regimental report. The total cases found for October, therefore, were 21, as follows:

Date.	Company.								Total.
	A.	B.	C.	D.	E.	F.	G.	H.	
October 1.....				2	1				3
3.....	1			1				1	3
5.....					1				1
6.....							1		1
7.....			1						1
8.....	1			1					2
11.....			1						1
15.....	1						1		2
18.....						1			1
19.....		1							1
23.....							1		1
24.....		1							1
26.....							1		1
27.....		1							1
30.....						1			1
Total.....	3	3	2	4	2	2	4	1	21

The regiment remained at Camp Meade, Pa., till November 14, when it left for Augusta, Ga.

The surgeon states on November report that the health of the regiment rapidly improved; that typhoid and malarial fever are on the decrease, and that the location of the camp from a hygienic standpoint is ideal.

Average strength for November: Officers, 26; enlisted men, 718. Admissions, 149, as follows:

Diarrhea.....	6
Malarial fever.....	15
Typhoid fever.....	6
Typhoid convalescents.....	3
All other causes.....	119

The diarrheas were of short duration.

Twelve cases of malarial fever were returned to duty within three days; 1 case, seven days; 1 case, twelve days, and 1 case, twenty-seven days.

One typhoid convalescent has been accounted for among the August cases. The date of commencement of the other two can not be told. They do not belong to cases originating in November.

Thus for November the cases of typhoid fever fell to 6, distributed as follows:

Date.	Company.	Number of cases.
November 22.....	E	1
7.....	B	1
10.....	B	1
7.....	H	1
28.....	D	1
19.....	A	1
Total.....		6

No cases of typhoid or malarial fevers are reported for December.

SUMMARY.

Assembled at Scranton, Pa., from which point the regiment went to Mount Gretna, Pa., April 28, 1898.

Arrived at Camp Alger, Va., May 19, 1898.

Had no case of typhoid fever at State encampment.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 20, 1898.

Typhoid fever in the Thirteenth Pennsylvania Volunteer Infantry, by months.

	June.	July.	August.	September.	October.	November.	Total.
Recognized cases.....	1	20	16	33	21	6	97
Probable cases.....			1	3	2	2	8
Total.....	1	20	17	36	23	8	105

Total cases of recognized typhoid fever..... 97

Total cases of probable typhoid fever..... 8

Total cases of recognized and probable typhoid fever..... 105

Number of deaths from recognized typhoid fever..... 15

Per cent of mortality among recognized cases of typhoid fever..... 15.46

Per cent of mortality among recognized and probable cases of typhoid fever..... 14.28

Left Camp Alger August 31, 1898.

Arrived at Camp Meade, Pa., August 31.

Left Camp Meade, Pa., for Augusta, Ga., on November 14, 1898.

THIRD VIRGINIA VOLUNTEER INFANTRY.

Not brigaded, First Division, Second Army Corps.

[Abstract of surgeon's statement—Maj. William Smith, U. S. Volunteers.]

The regiment was mustered into service May 14, 1898, at Richmond, Va., where it remained encamped till June 5, 1898.

The health of the men was satisfactory. Only a few cases of measles and diarrheal diseases prevailed. No case of typhoid fever occurred.

The regiment reached Camp Alger, Va., June 5, 1898, and was placed in a camp whose site is described as "isolated and well drained, with an abundant supply of good spring water." Later water was obtained from a deep well. The regiment occupied this camp till the 1st of August, when it was removed to a camp near Dunn Loring, Va.

Two cases of typhoid fever occurred in the first camp. One of these was imported with the regiment; the other occurred later, and its origin was not accounted for. The men were much in the habit of visiting surrounding farmhouses. The regimental surgeon, himself a resident of Alexandria, Va., was prepared to state that the section of country around about Camp Alger was notorious for typhoid fever during the summer and fall seasons.

REMARKS BY THE BOARD.

In a strength for May of 47 officers and 963 enlisted men there were 31 admissions to sick report for the period May 14 to 31, about equally divided between mild intestinal disorders and measles. No case of typhoid fever occurred.

From June 5 to August 1 this regiment occupied the same camp site at Camp Alger, Va.

Strength for June: Officers, 47; enlisted men, 935. Admissions, 478, as follows:

Diarrhea.....	102
Dysentery.....	19
Intermittent fever.....	28
Remittent fever.....	3
Continued fever.....	1
Typhoid fever.....	2
All other causes.....	323

Measles was prevalent during the month.

Only 2 cases of intestinal disorder were sent to hospital. These were returned to duty after eight to eleven days' treatment. All other cases were of short duration, both diarrheal and dysenteric.

The cases diagnosed as intermittent fever were treated in quarters and returned to duty as follows: After two to four days, 18; five to six days, 8; ten to twelve days, 2.

The 3 cases diagnosed as remittent fever lasted nine to eleven days.

There is no record of the duration of the case diagnosed as continued fever. This soldier was admitted to sick report June 19, and was still reported sick in the Second Division Hospital June 30. He was a member of Company B, from which 2 cases of typhoid fever were admitted on June 6 and June 22, respectively. Both of the latter cases terminated fatally. It is possible that this was also a case of typhoid fever.

We observe, however, that Private S. W., Company E, who was admitted with diarrhea on June 6 and returned to duty June 8, was readmitted on June 9 and sent to the Fort Myer General Hospital on June 16, where his case was diagnosed as typhoid fever.

Thus we find that this regiment imported at least 2 cases of typhoid fever into Camp Alger.

A third case was admitted on June 22. This soldier was, by the colonel's order, sent to a farmer's house, where he died July 7.

The foregoing, together with a case admitted from Company K on June 2 as diarrhea, and reported from the Third Division Hospital on June 24 as typhoid fever, make 4 typhoid fever cases for June.

It is worth noting that 2 of the cases diagnosed as remittent fever and lasting from nine to eleven days, respectively, were also admitted on June 19 from Company B.

The surgeon, in his remarks on June report, makes mention of 2 deaths from typhoid fever during June. Both of which occurred away from the regiment. One

of these died at Fort Myer on June 26—Private E. S., Company B. No record of the other case can be found.

Strength for July: Officers, 47; enlisted men, 1,046. Admissions, 357, as follows:

Acute diarrhea.....	64
Dysentery.....	14
Intermittent fever.....	22
Remittent fever.....	10
Continued fever.....	1
Typhoid fever.....	2
All other causes.....	244

The cases of diarrhea and dysentery were all of short duration, only 2 cases of dysentery lasting seven days. No one company was particularly affected, except Company D, which had 20 cases.

Cases diagnosed as intermittent fever were returned to duty as follows: After three to four days, 11; five to seven days, 6; eight to ten days, 4; twenty-one days, 1.

The cases of remittent fever were returned to duty after three to six days. One case, however, from Company K, admitted July 1 and to duty July 4, appears July 8 in the Second Division Hospital as a case of typhoid fever, the diagnosis being confirmed later at Fort Myer.

The case of continued fever was changed to typhoid fever at the division hospital.

We thus find, in addition to the 2 cases reported by the surgeon, 2 other cases of typhoid fever changed respectively from remittent fever and continued fever. The dates of occurrence were as follows: Company K, July 1, 1 case; Company E, July 9, 1 case; Company E, July 16, 1 case, and Company A, July 28, 1 case.

We also find recorded in the August report 2 cases of typhoid fever as admitted July 25 and 27 from Company L, one of which proved fatal on August 18, thus making a total of 6 cases of this disease for the month of July.

Of the 10 cases reported for June and July, 5 terminated fatally. This mortality would point to a larger number of cases in this regiment, but no available records can determine this.

About August 1 the regiment abandoned its first camp, occupied since June 5, and went into camp near Dunn Loring, Va., near the camp of the First Connecticut Volunteer Infantry. Its water supply was obtained from a driven well.

Strength for August: Officers, 47; enlisted men, 1,248. Admissions, 257, divided as follows:

Diarrhea.....	19
Dysentery.....	2
Intermittent fever.....	12
Remittent fever.....	27
Typhoid fever.....	7
All other causes.....	190

Intestinal disorders were of short duration, except 1 case transferred to hospital and changed to typhoid fever.

Of the cases diagnosed as intermittent fever, 9 were of less than seven days' duration; 1 lasted twelve days; 1 was of twenty days' duration, and 1 was furloughed.

Of the cases diagnosed as remittent fever, 2 were returned to duty after eight days' treatment; 20 cases were furloughed; 5 were transferred to hospital and changed to typhoid fever. There were also found 2 cases in the Second Division Hospital and 3 cases at Fort Myer diagnosed as typhoid fever, but which were not accounted for by the regimental surgeon. We are thus able to trace 18 cases of typhoid fever for August.

This, we believe, falls below the full prevalence of typhoid fever in this regiment for August. Could the 21 cases furloughed as remittent and intermittent fever be followed up, we believe that the majority would prove to be cases of typhoid fever.

It is not possible to further trace the occurrence of typhoid fever in this regiment. It left Camp Alger, Va., on September 8 for Richmond, Va., where the men were furloughed for thirty days.

The surgeon states that the prevailing diseases for the month of September were typhoid and malarial fevers; that many of the men were taken sick at home while on furlough; and that much difficulty was found in ascertaining the causes of sickness. He reports the names of 8 enlisted men having typhoid fever, 2 of whom were taken sick prior to departure from Camp Alger and 6 while on furlough. We have been able to add to these 8 cases 3 other cases for September, which were found in the Old Dominion Hospital, Richmond, Va., thus making 11 cases for the latter month. Four other cases were also admitted to the same hospital during October, but as we have not been able to ascertain the dates of the admission to sick report, these have not been charted with the other cases occurring in this regiment.

SUMMARY.

Mustered into service at Richmond, Va., May 14, 1898.

Arrived at Camp Alger, Va., June 5, 1898.

Had no case of typhoid fever at State encampment.

Imported two cases of recognized typhoid fever into its camp at Alger.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 22, 1898.

Typhoid fever in the Third Virginia Volunteer Infantry, by months.

	June.	July.	August.	September.	October.	Total.
Recognized cases.....	4	6	18	11	4	43
Probable cases.....						27
Total.....	4	6	18	11	4	70

Total cases of recognized typhoid fever..... 43

Probable cases of typhoid fever..... 27

Total cases of recognized and probable typhoid fever..... 70

Number of deaths from recognized typhoid fever..... 13

Per cent of mortality among recognized cases of typhoid fever..... 30.23

Per cent of mortality among cases of recognized and probable typhoid fever..... 18.57

Left Camp Alger September 8, 1898, for Richmond, Va.

FIRST CONNECTICUT VOLUNTEER INFANTRY.

Not brigaded, First Division, Second Army Corps.

[Abstract of surgeon's statement—Maj. T. F. Rockwell, U. S. Volunteers.]

The regiment was mustered into service May 14, 1898, at Niantic, Conn.

Companies F and K left Niantic for Fort Preble, Me., May 24, where they remained during June and a part of July. Companies I and E were sent to Plum Island, N. Y., May 29, and Company C to Portsmouth, N. H. Headquarters and four companies were located at Fort Knox, Me., during June and part of July.

The health of the several detachments was very good. No case of typhoid fever occurred in any of the companies prior to arrival at Camp Alger, Va., on July 19. The water supply after arrival was obtained at first from the Third Virginia Infantry's well, and later from a deep well bored for the regiment. Its camp site was well drained and suitable.

REMARKS BY THE BOARD.

A careful examination of the sick report of the scattered companies of this regiment for May and June at Fort Preble, Me., Portsmouth, N. H., Plum Island, N. Y., Great Gull Island, N. Y., and Fort Knox, Me., confirms the statement of the regimental surgeon as to the general good health of the regiment and the probable absence of typhoid fever prior to arrival at its Virginia camp.

Eight cases of malaria are recorded for May, and 7 cases of the same for June. These were of short duration, except 1 case admitted from Company F at Fort Preble, Me., which was of twenty days' duration.

Intestinal disorders were rare.

We note, however, the admission from Company M on July 16 of a case of "typhoid malaria" which was left behind at Niantic, Conn. Whether this case proved to be one of typhoid fever can not be stated.

The regiment reached Camp Alger, Va., July 19. Its mean strength for July was: Officers, 45; enlisted men, 1,174; admissions for the month from all causes, 230, divided as follows:

Acute diarrhea.....	103
Malaria.....	14
Typhoid fever.....	0
Typhoid malaria.....	3
All other causes (among which venereal diseases, Rhus poisoning, and heat prostration figure prominently).....	110

The diarrheas were mild, exceptionally lasting longer than two days.

The cases diagnosed as malaria were of short duration, except 1 case of ten days, admitted July 30.

One of the cases diagnosed as typhoid malaria was returned to duty after four days, and 1 case was left behind at Niantic, Conn. The third case, admitted from Company H, July 26, without any termination being given, is again admitted August 10 as acute diar-

rhea, and returned to duty August 12, from which it appears that although a case of typhoid fever was probably left at Niantic, no case was brought with this regiment to Camp Alger.

During the following month (August) in an average strength of 48 officers and 1,276 enlisted men we find 470 admissions, as follows:

Acute diarrhea	328
Malaria	42
Typhoid malaria	1
Typhoid fever	21
All other causes	78

Of the cases of acute diarrhea, 157 lasted only twenty-four hours; two to three days, 105; four to six days, 31; seven to ten days, 9; eleven to fifteen days, 4; thirty seven to forty days, 3; sixty-six days, 1, and 3 furloughed after twelve days' treatment.

Diarrheal diseases were distributed as follows:

	Cases,
Company A	27
B	24
C	34
D	24
E	25
F	48
G	38
H	23
I	35
K	22
L	12
M	13
Staff	3
Total	328

Companies D, K, L, and M had somewhat fewer cases of diarrhea than the other companies.

Of the cases diagnosed as malaria, 16 were returned to duty after twenty-four hours; two to three days, 7; four to six days, 9; seven to eleven days, 4; fourteen days, 1; eighteen days, 1; twenty-one days, 1; thirty-one days, 1; sixty days, 1, and 1 case furloughed after four days.

We also find 5 cases of remittent fever in the First Division Hospital, of which 4 were returned to duty after four, five, six, and eleven days, and 1 was furloughed after two days.

The case diagnosed as typhoid malaria was treated in quarters and returned to duty after twenty-four days. This case was admitted to sick report August 6.

The first cases diagnosed as typhoid fever were admitted August 5 and 6, respectively, from Company I, and on August 6 from Company K. Twenty-one additional cases were admitted during August. For occurrence by date and distribution by companies the chart of this regiment should be consulted.

If to the above cases there should be added the case diagnosed as typhoid malaria which lasted twenty-four days and the 5 cases of supposed malaria lasting from fourteen to sixty days, we believe that the total cases

of typhoid fever occurring during August would be more closely approximated.

We observe that the first case of typhoid fever that appeared in this regiment was admitted on the seventeenth day after its arrival at Camp Alger, and that 2 other cases occurred on the eighteenth day of the occupancy of its new camp.

We also observe that the number of cases that occurred during the month of August (24) was unusually large for the first month of the epidemic. This can be attributed to the fact that Camp Alger, Va., was already an infected camp at the time of this regiment's arrival, and that the conditions were, therefore, favorable for the propagation of the disease.

On September 7 the regiment left Camp Alger for Niantic, Conn., where it arrived on September 8.

For this month, in an average strength of 48 officers and 1,318 enlisted men, there were 398 admissions to sick report, as follows:

Acute diarrhea	201
Malaria	64
Typhoid fever	63
All other causes	70

The following was the duration of the cases of diarrhea: One day, 107; two to three days, 59; four to five days, 27; nine days, 2; furloughed after three to four days, 6. Five cases admitted as acute diarrhea were changed after one to three days' treatment to the diagnosis of typhoid fever. A like change was made in 1 case furloughed as acute diarrhea. These 6 cases are included in the 63 cases reported by the surgeon.

Of the 64 cases diagnosed as malaria, 29 were returned to duty within twenty-four hours; after three to five days, 10; six to eight days, 2; ten to twelve days, 5; thirty-one to thirty-eight days, 3. Eleven cases were furloughed and returned to duty after periods varying from thirty to thirty-eight days. Three furloughed cases could not be traced. One case furloughed after two days' treatment died twenty-three days later.

There were, therefore, 63 cases of recognized typhoid fever during the month of September. To these we would add 1 case diagnosed as malaria, which died on the twenty-fifth day of treatment, and 3 other cases of malaria under treatment from thirty-one to thirty-eight days. By reference to the chart of this regiment for September it will be seen that 20 of the 63 cases occurred in Company K, 9 cases in Company I, 7 in M, while Company A had no cases and the other companies but few men attacked.

This again points to some other source than the common water supply.

It will also be seen that 16 cases occurred during the first week of September prior to departure from Camp Alger, and that 41 additional cases were admitted between September 8, the date of arrival at Camp Haven, Niantic, Conn., and September 22, when the men were

furloughed for a period of thirty days. These 57 cases can be justly considered as infections incurred at the Virginia encampment. This explanation, however, would hardly account for the 7 cases admitted during the latter part of September, and certainly not for 51 cases of typhoid fever admitted during the month of October, as shown by the chart.

The regiment having abandoned its infected camp site at Camp Alger, Va., we should rather have looked for a marked reduction in the number of cases occurring after the usual period of incubation had passed. On the contrary, we find 44 cases of typhoid fever admitted between October 1 and 14. Seeking an explanation of these additional infections, we believe that it may be found in the length of time during which the regiment occupied its camp site at Niantic, Conn., viz, two weeks, a period sufficiently long to allow new sources of infection to become established.

As bearing upon the slight prevalence of malarial diseases at Camp Alger, Va., we observe that of 101 cases of fever admitted from this regiment to the hospitals at Hartford and New Britain, Conn., September 8 to October 26, 98 received the diagnosis of typhoid fever and only 3 cases that of malaria. In the latter cases the diagnosis of malaria was based on the temperature curve and not upon blood examination.

This regiment was mustered out of service on the 1st day of November, 1898.

SUMMARY.

Mustered into service at Niantic, Conn., May 14, 1898.
Arrived at Camp Alger, Va., July 19, 1898.
Had no case of typhoid fever at State encampment.
Did not import typhoid fever into Virginia camp.
Date of first case of recognized typhoid fever after arrival at Camp Alger, August 5, 1898.

Typhoid fever in the First Connecticut Volunteer Infantry, by months.

	August.	September.	October.	Total.
Recognized cases.....	21	63	51	135
Probable cases.....	3	4	.....	7
Total	24	67	51	142

Number of deaths from recognized typhoid fever 19
Per cent of mortality among recognized and probable cases
of typhoid fever..... 13.38
Left Camp Alger for Niantic, Conn., September 7, 1898.

TROOPS A AND C, NEW YORK VOLUNTEER CAVALRY.

Not brigaded; attached to Corps Headquarters.

[Medwin Leale, M. D., acting assistant surgeon, U. S. Army.]

REMARKS BY THE BOARD.

This squadron arrived at Camp Alger, Va., on May 23, 1898, and was placed in camp near the headquarters

of the Second Army Corps. Its water supply was obtained from a deep well located near the camp, and its fecal disposal was by means of open pits.

The mean strength of this command for the period May 22 to 31 was, officers, 6; enlisted men, 161. The admissions during this period were 5, namely:

Acute diarrhea	1
Typhoid fever.....	1
Injuries.....	3

The case of diarrhea was sent to duty at the end of two days.

The case of typhoid fever was admitted from Troop A on May 30, in the person of the captain commanding that troop. The diagnosis was confirmed at the general hospital at Fort Myer, so that this squadron imported 1 case of typhoid fever into its Virginia camp.

For the month of June, in a mean strength of 6 officers and 199 enlisted men, there were 88 admissions, namely:

Intestinal disorders.....	50
Remittent fever	3
Continued fever	2
Typhoid fever.....	4
Other causes	29

The surgeon remarks concerning the June report that the general health of the men has been good, but that they have been obliged to do a great deal of hard provost duty, and some of them have been debilitated in this way. He adds that there have been 3 cases of well-marked remittent fever; 4 cases of typhoid fever, and 3 cases of fever the nature of which has not been fully determined.

It appears that the surgeon laid down the following sanitary rules for the guidance of all concerned:

First. That all drinking water, other than Hygeia or Apollinaris, must first be boiled.

Second. That only boiled or other sterilized milk should be used.

Third. That ice will not be placed in drinking water, but used only for cooling the latter.

Fourth. The straw in the tents must be removed and burned every week.

He also remarks that in his opinion the cases of typhoid fever that occurred during June were contracted outside the camp.

Of the 50 intestinal disorders, 34 were returned to duty within 48 hours, 13 after three to five days, 1 case lasted nine days, 1 case lasted six days, and 1 was not traced.

The 3 cases of remittent fever lasted one, eight, and eighteen days, respectively.

The 2 cases diagnosed as continued fever were both changed to typhoid fever in the general hospital at Fort Meyer.

The diagnosis of the 4 cases of typhoid fever reported by the surgeon was confirmed.

These cases of typhoid fever, 6 in number, occurred as follows:

	Cases.
Troop A, June 1.....	1
A, June 24.....	1
A, June 28.....	1
C, June 25.....	1
C, June 29.....	2

The squadron having arrived on May 23, it would appear that the case reported from Troop A on June 1 was also probably an imported case.

The occurrence of 6 cases of typhoid fever in this small squadron of cavalry prior to the expiration of its first month at Camp Alger, Va., must be attributed to the chances for infection to which the members of this squadron were subjected during their various tours of provost duty in the surrounding country. We may add that the opportunity for infection within the camp, through the wise sanitary measures adopted by the squadron surgeon, were reduced to a minimum.

The squadron left Camp Alger, Va., for foreign service on July 23.

In a mean strength for this month of 6 officers and 200 enlisted men there were 21 admissions, namely:

Intestinal diseases	5
Remittent fever	4
Typhoid fever	1
All other causes	11

The cases of intestinal diseases were returned to duty within three days, except one case furloughed at the end of four days.

The cases of remittent fever were disposed of as follows: To duty after three days, 1; two days, 1; furloughed after two days, 1; furloughed after one day, 1.

The case reported as typhoid fever by the regimental surgeon was furloughed after one day. One case of typhoid fever, not reported by the regimental surgeon, was found in the general hospital at Fort Myer, Va.

The subsequent history of typhoid fever in this squadron during its service on the island of Porto Rico, from August to October, is of no particular importance, since the health of the command appears to have been very good during this time. Only 1 case of typhoid fever occurred during the month of August and 2 cases in September.

SUMMARY.

Mustered into service in May, 1898.
Arrived at Camp Alger, Va., May 23, 1898.
Had no case of typhoid fever at State encampment.
Imported 1 case of typhoid fever into Virginia camp and probably 1 other.
Date of first case of recognized typhoid fever after arrival at Camp Alger, June 24, 1898.

Typhoid fever in Troops A and C, New York Cavalry, by months.

	May.	June.	July.	August.	Sep-tember.	Total.
Recognized cases.....	a 1	a 6	a 2	1	2	12

^a These occurred at Camp Alger, Va.

Total cases of recognized typhoid fever.....	12
Number of deaths from recognized typhoid fever	1
Per cent of mortality among recognized cases of typhoid fever	8.33

Left Camp Alger, Va., for service in Porto Rico, July 23, 1898.
Returned from Porto Rico in October, 1898.

GENERAL DISCUSSION OF TYPHOID FEVER IN THE FIRST DIVISION, SECOND ARMY CORPS.

A careful examination of the regimental histories, which have been given above at some length, serves to bring out a number of salient features.

In the first place it will be seen that some of the regiments in the First Division while yet in their State encampments had one or more cases of typhoid fever, and that the majority of these organizations upon their arrival at Camp Alger imported at least 1 case of this disease into the Virginia camp.

We will have occasion to point out more than once the probability in assembling 1,000 men in any part of the United States that typhoid fever will appear among them within the period of incubation after their rendezvous.

We find that the following regiments of the First Division, Second Army Corps, imported typhoid fever into the camp at Camp Alger:

	Cases.
Sixty-fifth New York.....	1
Seventh Ohio	1
Sixth Massachusetts	1
Sixth Illinois	1
Eighth Pennsylvania	1
Third Virginia	2

The following regiments imported no cases:

First New Jersey.
Eighth Ohio.
Twelfth Pennsylvania.
Thirteenth Pennsylvania.
First Connecticut.

We do not think that the importance of keeping before us this fact of the importation of typhoid fever by regimental organizations can be too much emphasized, since in a number of cases this early importation has been overlooked by the regimental medical officers and since this may serve as a focus of infection for other cases of this disease. As regards this division of the Second Army Corps, however, in the majority of instances the disease having been recognized by the regimental surgeon, the soldier was promptly transferred to the general hospital at Fort Myer, Va., a point remote from the camp.

Another point to which we desire to direct attention is the considerable time which elapsed between the arrival of the several regiments at Camp Alger and the occurrence of the first case of typhoid fever in these organizations. This is shown by the following table:

Regiment.	Date of arrival.	Date of occurrence of first case of typhoid fever at Camp Alger.
Sixty-fifth New York.....	May 20	June 15.
Seventh Ohio.....	May 21	June 14.
First New Jersey.....	May 21	July 2.
Sixth Massachusetts.....	May 22	June 16.
Sixth Illinois.....	May 21	June 20.
Eighth Ohio.....	May 19	July 12.
Eighth Pennsylvania.....	May 18	June 25.
Twelfth Pennsylvania.....	May 19	June 26.
Thirteenth Pennsylvania.....	May 19	June 20.
Third Virginia.....	June 5	June 22.
First Connecticut.....	July 19	August 5.

The Third Virginia Infantry and the First Connecticut Infantry developed their first case in a shorter time than the other regiments, which, in the case of the last-named regiment, is readily to be referred to the fact that this organization arrived at Camp Alger at a period when the camp was already thoroughly infected with typhoid fever.

Another fact worthy of notice is the small number of cases which are recorded for the period ending June 30, at which time nine of the regiments belonging to this division had been in camp an average of forty days. (The Third Virginia and First Connecticut, attached to this division, but not brigaded, did not arrive until June 5 and July 19, respectively.)

We find the distribution of the cases of typhoid fever for this period as follows:

	Cases.
Sixty-fifth New York.....	2
Seventh Ohio.....	1
First New Jersey.....	None.
Sixth Massachusetts.....	9
Sixth Illinois.....	2
Eighth Ohio.....	None.
Eighth Pennsylvania.....	2
Twelfth Pennsylvania.....	2
Thirteenth Pennsylvania.....	1
Third Virginia (imported 2 others).....	2

It will thus be seen that, with the exception of the Sixth Massachusetts, no regiment had more than 2 cases during this period. The latter regiment arrived on May 22; had its first case on June 2, followed by a second and third case on June 16 and 18. We note also that 4 of the 9 cases in this regiment were confined to Company H, and that six of the companies of this regiment had no cases up to the time of their departure from Camp Alger, July 5; so that this particular regiment is an exception to the rule. The explanation is not hard to find, since this regiment was constantly on provost duty from the time of its arrival at Camp Alger, and hence the men were subjected to additional danger of infection.

In order to show that the performance of provost duty gives better opportunity for typhoid infection,

we may cite the course of typhoid fever in Troops A and C of the New York Cavalry Squadron, which occupied an excellent camp site near corps headquarters. This organization, numbering 6 officers and 199 enlisted men, arrived at Camp Alger on May 23 and imported 2 cases of typhoid fever, 1 on May 30 and 1 on June 1, both of which cases were promptly transferred to the general hospital at Fort Myer. This organization was principally used for provost duty; and notwithstanding the fact that its water supply was derived from a deep well, or was imported, as Hygeia, Apollinaris, and such waters, and that the well water was boiled, we observe that 4 additional cases of typhoid fever appeared during the month of June, unquestionably due to duties which would call them away from camp and thus expose them to various sources of infection in the surrounding country.

When we take into consideration the nature of the water supply at this camp during the latter part of May and a considerable part of the month of June, and the chances for water pollution, we think it particularly surprising that so few cases of typhoid fever can be traced among this division, numbering more than 12,000 men. The same remark will apply still more forcibly to the Second Division of the Second Army Corps during this period. This, to our minds, points unmistakably to the absence of sources of infection at Camp Alger during this time, and indicates clearly that these were sporadic cases contracted by the men during their absence from the camp, in the city of Washington and vicinity.

Lieutenant-Colonel Smart, deputy surgeon-general, U. S. Army, under date of July 13, 1898, reports as follows:

These camps, notwithstanding their many unsanitary factors, are unusually free from disease. Vaccinia, measles, a few venereal cases from proximity to Washington, and some diarrheas from irregularities in diet or from chill after perspiration and the difficulty of attending to personal comfort in the crowded tents constitutes the sick list. In addition to these I found that since the camp was established, in May, 39 cases of typhoid fever had been reported and sent to hospital for treatment. * * * Four occurred during the month of May, 23 in June, and 12 up to the date of my inspection in July. Taking the month of June as the second month of the aggregation of troops, * * * and rating the strength at Camp Alger during that month as 20,000, the fever rate for the month would be 1.15 cases per 1,000 men.

As a matter of fact, Colonel Smart, relying upon the testimony of the regimental medical officers, reported fewer cases of typhoid fever up to July 13, 1898, than had actually occurred.

After the most careful search we have been able to trace up to the 30th of June, a period of about forty days since the establishment of the camp—excluding imported cases—21 cases of this disease among the regiments of the First Division and 11 cases among those constituting the Second Division; total, 32.

Basing the calculation upon the mean strength of the First Division for the month of June—namely, 11,137—

we find a percentage of 1.88 cases of typhoid fever per 1,000 men. Taking the mean strength of the Second Division for the month of June—namely, 11,257—we find a percentage of only 0.97 per 1,000 men. The percentage for both divisions for the period ending June 30 is 1.42 per 1,000 men.

If we take the period ending July 15, we find that 71 cases of recognized typhoid fever have occurred in the First Division and 32 cases in the Second Division, or a total of 103 cases, as against 39 cases reported by Colonel Smart for the period ending July 13, or a percentage of 4.06 per 1,000 men in a mean strength for both divisions of 25,341 men. The percentage for the First Division alone for this period, based upon the mean strength for July—viz, 13,135—is 5.40; and the percentage for the Second Division alone, also based on the mean strength for July—viz, 12,206—is 2.62 per 1,000 men.

It will thus be seen that typhoid fever had made but slight progress in both divisions of the Second Army Corps up to the period ending June 30, but that during the succeeding fifteen days, constituting the first half of July, the disease had slowly but steadily increased to the extent of 4.06 per 1,000 men.

Returning to the First Division, which, all things taken into consideration, was placed in less favorable circumstances than the Second Division, we observe that contamination of the general water supply at a period when this supply was most questionable and most subject to contamination, does not appear to have occurred, since we find that up to June 30, of the 110 company organizations, including 1 hospital corps company, constituting this division at that time, 92 companies had had no cases of typhoid fever, although the water supply was the same for all companies in each regiment. In other words, only 18 company organizations in this division had experienced cases of typhoid fever up to the 30th of June.

We desire to call attention, however, to the fact that notwithstanding the absence of contamination of the general water supply, the occurrence of 32 sporadic cases of typhoid fever among these 18 company organizations, constituting so many foci of infection internal to this division, was pregnant with meaning for the further spread of the disease. It was just at this time that a better, purer, and more abundant water supply had been obtained through the sinking of a bored well for each regiment; but notwithstanding this purer water supply, typhoid fever continued to increase. These wells were of the artesian class, and varied in depth from 47 feet to 156 feet, only 5 out of 40 wells being less than 60 feet in depth.

In boring for water a layer of very impervious clay of varying thickness was met with. Below this was found a layer of rock into which the hole was drilled until a satisfactory yield of water was secured. Simultaneously with the boring of the well a wrought-iron

pipe was driven downward by repeated falls of a heavy weight until, when rock was reached, a water-tight joint was made by driving the pipe until its cutting edge practically refused to go farther.

We can well believe the statement of Lieutenant-Colonel Lusk, chief engineer, to whom we are indebted for the foregoing information concerning the construction of these wells, when he states that, in his opinion, "these artesian wells were not subject to surface contamination owing to the method of constructing them, and the character of the strata through which they passed." He further adds: "The water supply in each case appeared to come from the extreme bottom of the well and to have no connection with the ordinary veins found at slight depths."

We may here state that following close upon our inspection of this division during the latter part of August, 1898, we subjected the samples of water from the wells of the Eighth, Twelfth, and Thirteenth Pennsylvania Infantry, of the Ninth Ohio Battalion, of the well at corps headquarters, and of the house well near the latter, to careful bacteriological examination, and were unable to isolate the colon bacillus from any of these sources, except in the case of the house well, which was practically an open well liable to contamination from air dust. These wells were all located in the old camps of the First Division, which were occupied until the beginning of August.

We also had careful bacteriological examinations made of the water from all the wells in the new camp of this division, and were able to isolate a micro-organism resembling the colon bacillus in two instances, namely, from the well of the First New Jersey and First Connecticut Infantry.

Notwithstanding the purity of the water supply, therefore, and contrary to the generally accepted opinion on the part of the medical profession, we find that typhoid fever, having been imported into various, although few, company organizations of this division, now steadily advanced; so that, as compared with the first fifteen days of July, when only 50 cases of typhoid fever were recorded for this division, we find during the second half of this month not less than 131 cases of this disease had occurred, and that the number of company organizations affected increased from 18 to 35 out of a total of 74 companies at that time constituting the First Division.

The escape from the occurrence of typhoid fever of more than one-half of the companies of this division (39) still points unmistakably to the absence of contamination of the general water supply.

The only exception to the freedom from water contamination is in the case of Company G, Twelfth Pennsylvania Volunteer Infantry. By reference to the individual history of this regiment above given, it will be seen that there is strong evidence pointing to the infection of the shallow well constructed by the men of

this company, owing to close proximity to the battalion privy. It will be further observed that the large number of cases occurring in this particular company strongly contrasts with the few that occurred in the companies of other regiments of this division.

At this period (July 31), when cases of typhoid fever had occurred in 47 per cent of the company organizations of the First Division, we find that notwithstanding change of camp sites made by the several regiments during the last few days of July or the first week in August, and in spite of much attention given to camp sanitation, the disease made steady and rapid progress during August as compared with the month of July. Thus, we find, in a mean strength of 9,464 for August, there occurred 326 cases of recognized typhoid fever in this division, or a percentage of 34.44 per 1,000 men.

If we turn to the course of this disease in the several brigades of this division, we find that the percentage per 1,000 men rises in the First Brigade—composed of the Sixty-fifth New York, Seventh Ohio, and First New Jersey—to 48.17; in the Third Brigade—composed of the Eighth, Twelfth, and Thirteenth Pennsylvania—to 32.63; while in the two regiments not brigaded, consisting of the Third Virginia and the First Connecticut, the percentage was 17.36 per 1,000 men. It will be recalled that from the well water of the last-mentioned regiment a bacillus was isolated which somewhat resembled the colon bacillus. (No calculation is made for the Second Brigade, as this had left for service in Porto Rico on the 5th of July.)

The highest rate of percentage per 1,000 men was attained in the case of the Sixty-fifth New York Infantry, in which, in a mean strength of 1,315 men for August, there were 123 cases of recognized typhoid fever, or a percentage of 93.53 per 1,000. This regiment therefore leads all of the regiments in the First Division as regards percentage of cases per 1,000 men.

By referring to the individual record of this regiment it will be seen that during the month of July there occurred 24 cases of typhoid fever, 16 of which were confined to Company E. It will further be seen that prior to its removal from its old camp site to a new and higher camp on August 8 there had occurred 26 additional cases of typhoid fever, and that within twelve days following its change of camp site there were 44 additional cases which could be attributed to infection in the old camp. Even after the lapse of this period, however, the disease continued unchecked, since we find 53 cases occurring during the last eleven days of August. There could be no doubt, therefore, that the majority of the companies of this regiment were pretty well infected with typhoid fever prior to the change of camp site, and that the sources of infection—probably individual to the companies—continued in the new camp.

We may here state that at the time of our inspection of this regiment, on the 23d day of August, 1898, we

found 16 men on an average in each Sibley wall tent, and no provision made for flooring the tents. In a number of tents inspected by us, bedding, clothing, together with other articles, were in contact with the ground and thoroughly covered with dust and dirt. If tent infection, which we will discuss in another part of this report, is concerned in the spread of typhoid fever, then all of the necessary conditions were present in this regiment for the propagation of the disease in this manner.

We here recall that at the time of our inspection our attention was invited to the fact that the location of the well of the Sixty-fifth New York in the camp occupied by it during the latter half of June, July, and the first week of August was such as to receive the surface drainage from the entire First Brigade. Our own inspection verified this undesirable location of the well. It does not follow, however, that the water of this well became contaminated so as to constitute a factor in the spread of typhoid fever in this regiment, since we find that of the 12 companies, all of which were making free use of the water, Companies C and K had no cases of typhoid fever during July or the first week in August, while Companies D, G, and I had, during July and the entire month of August, respectively, only 4, 7, and 4 cases. Indeed, typhoid fever in this regiment was largely confined during August to Companies A (12), B (11), C (16), E (9), F (25), and L (15). We have not, therefore, hesitated to exclude this well as the source of regimental infection.

The inspection of the camp of the Sixty-fifth New York, made by the board, was followed by a like inspection of the several camp sites of the regiments constituting the division. As a result of this inspection we were gratified to find that much care was being given to camp sanitation, such as the general police of the camp site and the disposition of garbage and excreta, although the latter, in the majority of regiments, was by no means satisfactorily carried out. In all sinks we were able to observe fecal matter exposed to the access of large numbers of flies. An exception to this statement was found in the case of the Twelfth Pennsylvania Infantry, which regiment was located in a camp to itself near Dunn Loring Station. Here we found that, by the direction of the colonel commanding, each privy vault was guarded by a regularly posted sentinel, whose duty it was to compel each soldier to cover his stool with earth as soon as deposited. Not only was this effectually carried out, but upon leaving the sink the soldier was compelled to thoroughly wash his hands with soap and water provided for that purpose.

We here note that, in spite of change of camp site and the enforcement of better sanitary police, typhoid fever did not markedly decrease in this regiment until the beginning of the fourth week in August, the camp site having been changed on August 2.

During the last two days of August and the early part of September the First Division of the Second Army Corps abandoned Camp Alger, Va., the eight regiments constituting the division at that time taking their departures as follows:

Twelfth Pennsylvania	August 29.
Eighth Pennsylvania	August 30.
Thirteenth Pennsylvania	August 31.
Seventh Ohio	September 1.
First New Jersey	September 2.
Sixty-fifth New York	September 4.
First Connecticut	September 7.
Third Virginia	September 8.

All of these regiments, except the Eighth, Twelfth, and Thirteenth Pennsylvania Infantry, left for their State encampments and for muster out of the service of the United States. The Twelfth Pennsylvania only remained at Camp Meade, Pa., until September 19, when it also left for muster out of service. The Eighth and Thirteenth Pennsylvania Infantry remained at Camp Meade as a part of the garrison stationed at that point and later were transferred to Camp McKenzie, Augusta, Ga.

The subsequent course of typhoid fever in these several regiments following their departure from Camp Alger has already been set forth in the individual histories of these regiments and need not here be further referred to, except to state that whenever the transfer of the regiment was followed by enforced sanitary measures typhoid fever slowly, but steadily, decreased; or where the regiment already infected with typhoid fever remained at its State encampment for a period of ten or more days, as in the case of the First Connecticut Infantry, the number of cases of typhoid fever rapidly increased, owing, as we think, to new sources of infection having been established during this time.

We have made no reference thus far to the course of typhoid fever in the Second Brigade of the First Division, since this brigade, consisting of the Sixth Massachusetts, Sixth Illinois, and Eighth Ohio, infantry, left Camp Alger on July 5, 1898, for service in Porto Rico and Cuba.

The Eighth Ohio Infantry arrived at Santiago, Cuba, on July 13. By consulting the individual history of this regiment it will be seen that 1 case of typhoid fever was admitted on July 12, and hence points to infection prior to the departure from Camp Alger. Owing to lack of data, no definite knowledge can be obtained concerning the further occurrence of typhoid fever in this regiment except that given in its history before mentioned.

In the case of the Sixth Massachusetts Infantry and the Sixth Illinois Infantry, we find that these regiments were quartered on the U. S. S. *Yale* from July 8 to July 25, and that the former regiment having become infected with typhoid fever prior to departure from Camp Alger owing to provost-marshal duty, not less

than 49 recognized cases of typhoid fever occurred during the month, the majority of the cases having originated on the voyage from Charleston, S. C., to Guanica, P. R.

The Sixth Illinois Infantry had already had 2 cases of typhoid fever during June at Camp Alger, but appears to have largely escaped the disease during the voyage to the island of Porto Rico, since we have only found 6 recognized cases of typhoid fever for the month of July. The subsequent history of typhoid fever in this regiment is given in its individual history.

TYPHOID FEVER IN THE SECOND DIVISION, SECOND ARMY CORPS.

TWENTY-SECOND KANSAS VOLUNTEER INFANTRY.

First Brigade, Second Division, Second Army Corps.

[Maj. J. P. STEWART, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

The regiment was mustered into service during the early part of May, 1898, at Camp Leedy, Topeka, Kans., and arrived at Camp Alger, Va., May 28. It did not import typhoid fever into its new camp.

The same remarks apply to camp site, water supply, and fecal disposal of this command that have already been recorded for the regiments of the First Division.

The surgeon remarks on the May report that, in addition to measles, acute bronchial affections have prevailed. For this month, in a mean strength of 46 officers and 968 enlisted men, there were 58 admissions, consisting of—

Intermittent fever	5
Intestinal disorders	4
All others (largely bronchial diseases)	49

No case was of importance.

During the succeeding month (June), in a mean strength of 46 officers and 1,059 enlisted men, the admissions have risen to the high figure of 705, as follows:

Intestinal disorders	172
Intermittent fever	98
Typhoid fever	0
All other causes, including vaccination	435

Two hundred and eighty-eight recruits joined the regiment between June 26 and 30.

The intestinal cases were diagnosed as acute dysentery. Their duration was as follows: One day, 72; two to three days, 56; four to seven days, 30; eight to thirteen days, 17; twenty days, 1. All were treated in quarters. The application of the above-given diagnoses to all intestinal cases is questionable.

Of the cases diagnosed as intermittent fever, 33 went to duty after twenty-four hours; within three days, 35; four to eight days, 19; ten to fifteen days, 9; 1 lasted twenty-five days, and 1 was not returned to duty till at the end of four months. In other words, during the last ten days of June supposed malarial diseases began

to be of more protracted duration. Some of these cases were in all likelihood cases of typhoid infection. The case admitted from Company A on June 21, of four months' duration, was hardly other than a case of typhoid fever.

The admissions for July reported by the surgeon, in a strength of 46 officers and 1,295 enlisted men, were 230, as follows:

Diarrhea.....	32
Intermittent fever.....	69
Typhoid fever.....	1
All other causes.....	128

Measles prevailed during the month.

The surgeon reports that whereas the water supply has been poor it was much improved during July, and that although the tents have been floored many of them leak badly.

The diarrheal diseases were as a rule short in duration, 27 cases being returned to duty within four days; 3 cases lasted from five to eight days; 1 case was fourteen days in duration; and 1 case, being transferred to hospital, was changed to the diagnosis of typhoid fever.

The majority of cases diagnosed as intermittent fever were likewise of short duration, 36 cases going to duty within three days; after four to eight days, 19; 7 cases lasted from nine to thirteen days; fifteen days, 3; thirty-one days, 1; fifty-eight days, 1; and 2 cases were changed in hospital to typhoid fever. So that we must add to the 1 case of typhoid fever recognized by the surgeon 1 case changed from acute diarrhea and 2 cases from intermittent fever to typhoid fever, thus making 4 recognized cases of this disease for July. The earliest case of typhoid fever was admitted on July 27, from Company K.

This, however, does not represent the true prevalence of the disease, since it does not include the other prolonged fevers, varying from thirteen to fifty-eight days, treated by the surgeon as intermittent fever. We should add not less than 6 cases of this character to those already reported, making a list of 10 cases for July.

The regiment having occupied its same camp site since May 29, left Camp Alger on August 3 with the other regiments of the Second Division en route for Thoroughfare Gap, Va., arriving at Camp Meade, Pa., August 10, 1898.

The surgeon states that malarial diseases have been prevalent during August. The strength for this month was: Officers, 44; enlisted men, 1,239; and the admissions 170, divided as follows:

Diarrheal diseases.....	9
Intermittent fever.....	69
Typhoid fever.....	4
Other diseases.....	88

Intestinal cases were few in number. One lasted ten days; all others were short, except 2 cases sent to hospital and changed to the diagnosis of typhoid fever.

The duration of the cases diagnosed as intermittent fever was as follows: One day, 9; two days, 7; three to five days, 17; six to ten days, 8; thirteen days, 2; fifteen days, 2; twenty to twenty-seven days, 5; thirty to forty-five days, 4; forty-eight to sixty-nine days, 6.

Of 10 cases transferred to division hospital the diagnosis was changed in all to typhoid fever. Besides, there were found in State hospitals 6 other cases of typhoid fever, which were admitted during August but not accounted for on other returns.

Thus we find for August, 22 recognized cases of typhoid fever which we have charted for this month. This number, however, falls short in recording the prevalence of the disease, since this does not include 17 cases of prolonged fevers lasting from fifteen to sixty-nine days, and which we believe to be cases of typhoid fever.

It will be later seen that the proportion of fatalities to the recognized cases of typhoid fever is unusually high for the Twenty-second Kansas. If we include among the typhoid fevers those other prolonged fevers, diagnosed as malarial, the mortality corresponds to that of other regiments under similar conditions.

The regiment left Camp Meade for Fort Leavenworth, Kans., on the 9th day of September, the men being furloughed for 30 days on September 12.

The mean strength for the month of September was: Officers, 44; enlisted men, 1,230; and the admissions, 45, as follows:

Diarrhea.....	6
Intermittent fever.....	17
Continued fever.....	4
Typhoid fever.....	7
All other causes.....	11

The diarrheas were trivial in character.

The cases diagnosed as intermittent fever gave the following result: To duty within three days, 6; five to seven days, 3; twenty days, 1; twenty-nine to fifty-five days, 6; and 1 changed to typhoid fever. The 4 cases of continued fever being transferred to hospital were changed to typhoid fever.

We thus find 12 cases of recognized typhoid fever for the month of September, which again plainly falls below the true number. We would add not less than 7 cases of prolonged fever, bringing the cases to 19. We doubt whether this expresses the prevalence of the disease, since the 14 cases recorded for October (vide chart) occurred during the furlough period, September 12 to October 11, and should more accurately be added to the September cases.

No further data are available as regards the medical history of this regiment.

The total cases of typhoid fever recorded for this regiment as heretofore given is 52, and the number of deaths 11. Such a rate of mortality is unusual in our study of typhoid fever in military camps, and plainly points, in our opinion, to a large number of un-

recognized cases of this disease treated by the surgeon under the diagnosis of intermittent or continued fever or malaria. We have already called attention to these prolonged fevers under their respective months.

SUMMARY.

Mustered into service in early part of May, 1898, at Topeka, Kans.

Arrived at Camp Alger, Va., May 28, 1898.

Had no case of typhoid fever at State encampment.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, July 27, 1898.

Typhoid fever in the Twenty-second Kansas Volunteer Infantry, by months.

	June.	July.	August.	Sep- tember.	Octo- ber.	Total.
Recognized cases.....		4	22	12	14	52
Probable cases.....	1	6	17	7		31
Total	1	10	39	19	14	83

Total cases of recognized typhoid fever..... 52

Total cases of probable typhoid fever..... 31

Total cases of recognized and probable typhoid fever..... 83

Number of deaths from recognized typhoid fever..... 11

Per cent of mortality among recognized cases of typhoid fever..... 21.15

Per cent of mortality among recognized and probable cases of typhoid fever..... 13.25

Left Camp Alger, Va., en route for Thoroughfare Gap, Va., August 3. Arrived Camp Meade, Pa., August 10.

**ONE HUNDRED AND FIFTY-NINTH INDIANA VOL-
UNTEER INFANTRY.**

First Brigade, Second Division, Second Army Corps.

[Maj. T. C. Stunkard, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was mustered into service May 13, 1898, at Camp Mount, Indianapolis, and remained at this camp until May 22. It arrived at Camp Alger, Va., on May 24.

The surgeon states that the prevailing diseases have been dysentery, intermittent and remittent fevers, and that in order to control these water has been boiled and the men restrained from indulging in improper food.

Mean strength for the month of May: Officers, 50; enlisted men, 976. Admissions to sick report, 121, as follows:

Acute diarrhea.....	30
Acute dysentery.....	7
Intermittent fever quotidian.....	17
Intermittent fever tertian.....	11
Remittent fever.....	1
Typhoid fever.....	0
All other causes.....	55

The intestinal disorders were of short duration, only 1 case lasting eight days.

Twenty-three malarial fevers were returned to duty within three days; 4 after six days; 2 after twelve days.

No case of typhoid fever could be found; and as the first case was not admitted to sick report till two weeks later, it is safe to assume that this regiment did not import typhoid fever into its Virginia camp.

The regiment occupied its same camp site during June, during which time it made a march on June 23 to 25 to Diffieult Run, Virginia, and return.

Summary for June: Mean strength—officers, 48; enlisted men, 1,230. Admissions, 135, as follows:

Diarrhea.....	29
Dysentery.....	10
Intermittent fever quotidian.....	31
Tertian intermittent.....	11
Malaria.....	20
Remittent fever.....	3
Typhoid fever.....	1
Other causes.....	30

Of the intestinal diseases, 25 went to duty within two days, 10 within five days, 1 after six and 1 after nine days' treatment, and 2 cases were transferred to hospital and could not be traced.

The majority of the cases diagnosed as malaria were of brief duration, 40 being returned to duty within three days; four to six days, 16; eight days, 2; eleven days, 4; fifteen days, 1. One case from Company B diagnosed as tertian intermittent by the surgeon on June 14 was transferred to Fort Myer June 23 and changed to the diagnosis of typhoid fever, the patient dying on June 25. This was the first case of typhoid fever in this regiment. A second case, admitted on June 23, was transferred on June 29 as a case of remittent fever to Fort Myer and changed to the diagnosis of typhoid fever. So that for the month of June 2 cases of this disease occurred in the One hundred and fifty-ninth Indiana Infantry.

The same camp site was occupied during July. The surgeon states that the month was "especially severe upon the health of the troops, due to the extreme heat and its consequent depressing effect. Typhoid fever rapidly increased, both in virulency and in number of men infected. The camp at Alger became so unhealthy that almost 40 per cent of the regiment became ill as the result of malaria, typhoid, dysentery, or diarrhea, but most of the men infected continued to perform most of their duties in spite of their physical ills."

In an average strength of 46 officers and 1,262 enlisted men, there were 170 admissions for the month of July, as follows:

Acute diarrhea.....	16
Dysentery.....	7
Intermittent quotidian.....	12
Intermittent tertian.....	14
Continued fever.....	15
Undetermined.....	6
Typhoid fever.....	4
Other causes.....	96

Of the 16 cases of diarrhea, 8 were treated by the surgeon with the following duration: One to three days, 7; twelve days, 1; 8 were transferred to hospital, of which 7 were returned to the regiment within two to seven days without diagnosis, and 1 could not be traced.

Of the 7 cases of dysentery, 3 were treated by the surgeon and returned to duty within two to five days, 4 were sent to hospital, 1 of which was returned to the regiment after three days with no diagnosis, and 3 could not be traced.

Of the supposed quotidian intermittents, 6 were returned to duty within three days; 6 were transferred to hospital, of which 1 was returned to duty after ten days (diagnosis malaria), and 5 were changed to typhoid fever.

Of the 14 cases of supposed tertian intermittent reported by the surgeon, 7 were returned to duty within three to five days, and 7 were sent to hospital, of which 3 were returned to duty, diagnosis unchanged, after five, ten, and fifteen days, and 4 were changed to the diagnosis of typhoid fever.

Six other cases with the diagnosis of tertian intermittent were found in the Second Division Hospital, and were treated from one to five days before being returned to duty.

The cases of continued fever were all sent to hospital with the following result: Returned to duty after one to three days, 7; eight to twelve days, 3; changed to typhoid fever, 3; not traced, 2.

So that to the 4 cases of typhoid fever reported by the surgeon, and which were confirmed, we must add 12 other cases, as before mentioned, making a total of 16 recognized cases for the month of July.

Continuing the medical history of this regiment the surgeon remarks:

On August 3, 1898, the regiment left Camp Alger with other regiments of the Second Division, and after a march of six days over a distance of about 50 miles, it reached Thoroughfare, Va. Stops were made at Burkes Station, Bull Run, near Clifton, and Bristow. The weather was most unfavorable for this march, and much of the illness was due to heat and rain. The water supply on the march was not sufficient, and the supply of rations was short. Typhoid fever has gradually disappeared from the regiment, and the general health of the command has improved very much since leaving Camp Alger. It was a noticeable fact that, in spite of the heat and fatigue of the march, the health continued to improve. Malaria seems to be the prevailing malady, and there is very little illness due to other causes.

Mean strength for August: Officers, 35; enlisted men, 1,159. Admissions, 142, as follows:

Diarrhea.....	14
Dysentery	9
Tertian intermittent.....	30
Quotidian intermittent	12
Malarial intermittent.....	20
Remittent fever.....	12
Typhoid fever.....	18
Other causes	27

All intestinal cases were sent to division hospital, of which 2 cases were returned to duty after four days;

10 cases were changed to the diagnosis of typhoid fever, and 11 cases could not be traced.

Of 62 cases embraced under the terms tertian, quotidian, or malarial intermittent, all were sent to division hospital. Omitting 29 of these cases, of which no record of admission could be found, we find 33 cases terminating as follows: To duty within five days, 4; six to eight days, 9; changed to typhoid fever, 17, and 3 furloughed as "malaria" after eight to eleven days' treatment.

Of the 12 remittents transferred to hospital, 8 were returned to duty within four days; 2 furloughed after four and twenty-five days' treatment; and 2 were not traced.

We also find in the Second Division Hospital 3 cases of typhoid fever of whose names the surgeon's report contains no record, and 1 case still under treatment after twenty-nine days as tertian intermittent. This case could not be further traced.

Of the 18 cases reported by the surgeon, the diagnosis of typhoid fever was confirmed in all; but as 3 of these cases dated the commencement of their attack to July 30 and 31, these have already been included in the cases for July.

We are thus able to trace 45 cases of typhoid fever for the month of August, 16 of which were admitted during the first three days of the month prior to leaving Camp Alger, and 8 other cases within twelve days after the regiment's departure from its Virginia camp. These could also be considered as infections incurred in the old camp, thus leaving 21 cases due to infections while on the march or during the last six days of August, after arrival at Camp Meade, Pa.

The regiment arrived at the latter camp on August 25, and remained at that point till September 11, on which date it left for Indianapolis, Ind., arriving on September 12. On September 17 officers were granted leave and men furloughed to November 10, 1898.

Mean strength for September: Officers, 40; enlisted men, 1,115. Admissions, 136, as follows:

Diarrhea.....	25
Tertian intermittent.....	47
Quotidian intermittent.....	20
Remittent fever	1
Typhoid fever.....	2
Typhoid suspects.....	5
Other causes	36

Intestinal disorders were returned to duty within five days, except 3 cases sent to hospital, of which 1 was changed to typhoid fever, and 2 could not be traced.

Omitting 30 cases diagnosed as some type of malarial fever, of which no further record could be obtained, we find 38 cases supposedly of this character under treatment, with the following result: To duty within five days, 25; eight to fourteen days, 3; changed to the diagnosis of typhoid fever, 10.

Of the 2 cases of typhoid fever reported by the surgeon and 5 cases reported as typhoid "suspects," the diagnosis was confirmed at the division hospital.

We thus find 17 cases of this disease for a part of the month of September, 14 of which occurred prior to the regiment's departure from Camp Meade, Pa.

Owing to the absence of records, we have not been able to further trace the course of typhoid fever in this regiment.

Under date of September 17, the surgeon states that the health of the regiment has improved rapidly since leaving Camp Alger, Va., there being but little sickness at this time.

The regiment was mustered out of service on November 23, 1898.

SUMMARY.

Mustered into service May 13, 1898, at Indianapolis, Ind.

Arrived at Camp Alger, Va., May 24, 1898.

Had no typhoid fever at State encampment.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 14, 1898.

Typhoid fever in the One hundred and fifty-ninth Indiana Volunteer Infantry, by months.

	June.	July.	August.	Sep-tember.	Total.
Recognized cases	2	16	45	17	80
Probable cases		6	3		9
Total	2	22	48	17	89

Total cases of recognized typhoid fever..... 80

Total cases of probable typhoid fever..... 9

Total cases of recognized and probable typhoid fever..... 89

Number of deaths from recognized typhoid fever..... 8

Per cent of mortality among recognized cases of typhoid fever..... 10.00

Per cent of mortality among recognized and probable cases of typhoid fever..... 9.10

Left Camp Alger, Va., August 3, 1898, en route to Thoroughfare Gap, Va.

Arrived at Camp Meade, Pa., August 25, 1898.

THIRD NEW YORK VOLUNTEER INFANTRY.

First Brigade, Second Division, Second Army Corps.

[Maj. William M. Bemus, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was assembled at Camp Black, Long Island, about May 15, 1898.

The regimental sick report, which begins on May 17, 1898, gives the strength, May 17 to 31, as officers, 45; enlisted men, 973; admissions, 56, consisting almost entirely of acute catarrhal affections of the respiratory tract.

The regiment reached Camp Alger, Va., May 29, 1898, and was placed in camp near the Third Missouri Volunteer Infantry. It occupied this site till its departure from Camp Alger on August 3.

Like other regiments, its water supply was obtained from shallow springs at first; later it was supplied with a driven well 137 feet in depth.

Strength for June: Officers, 47; enlisted men, 1,129. Admissions, 486, as follows:

Acute diarrhea.....	154
Acute dysentery.....	13
Acute indigestion.....	23
Tertian malaria.....	1
Typhoid fever.....	1
All other causes, chiefly vaccinia.....	294

All intestinal disorders were mild in character and of short duration, the majority being returned to duty within two days. No case lasted longer than eight days.

The case of tertian malaria lasted three days.

The case of typhoid fever, the first to occur in the regiment, was admitted from Company H on June 18, the diagnosis being confirmed at the general hospital, Fort Myer, Va., so this regiment did not import typhoid fever into its Virginia camp.

During July, in an average strength of 48 officers and 1,269 enlisted men, there were 108 admissions, as follows:

Acute diarrhea.....	48
Acute dysentery.....	4
Tertian malaria.....	15
Continued fever.....	15
Typhoid fever.....	0
Other causes.....	26

Of the 48 cases of diarrhea, 24 were returned to duty within twenty-four hours; after two days, 8; three days, 8; three to five days, 5; 1 case lasting twenty-three days was treated by the surgeon, and 2 cases lasting twenty-three and twenty-six days, respectively, were transferred to the Second Division Hospital and there changed to the diagnosis of malarial fever.

The last-mentioned cases, both admitted on July 4 from Companies C and D, were probably cases of typhoid fever.

Of the cases diagnosed as dysentery, 2 went to duty after twenty-four hours; 1 after seven days, and 1, returned to duty after twenty-four days, was promptly readmitted and transferred to Fort Myer, where the diagnosis was changed to typhoid fever.

The cases diagnosed as tertian malaria resulted as follows: Duty after one to three days, 3; five to seven days, 4; fourteen to fifteen days, 2. These were treated in quarters. Five cases were transferred to hospital and were all changed to the diagnosis of typhoid fever. One case, admitted from Company D July 10, was reported as still sick on August 31. This should also be regarded as a case of typhoid fever.

Of 15 cases diagnosed as continued fever, 2 were returned to duty within four days, 12 were transferred to hospital and changed to the diagnosis of typhoid fever, and 1 was not traced.

We also find at the general hospital, Fort Myer, 2 cases of typhoid fever which were not accounted for by the regimental surgeon and which were admitted as tertian malaria.

We thus find that although no cases of typhoid fever were reported by the regimental surgeon for July, not less than 20 cases were recognized in the division and general hospitals. Of these, 1 case was admitted as dysentery, 7 as tertian malaria, and 12 as continued fever. (Vide chart.)

The regiment abandoned its camp site August 3, and began a march through Virginia with the Second Division, Second Corps. From Thoroughfare Gap, Va., it was transferred by rail, arriving at Camp Meade, Pa., on August 29 and 30.

During this month, in an average strength of 46 officers and 1,244 enlisted men, there were 235 admissions to sick report, as follows:

Acute diarrhea.....	21
Acute dysentery.....	6
Malaria tertian.....	22
Continued fever.....	159
Typhoid fever.....	2
Continued high temperature.....	2
All other causes.....	23

Of the 21 cases of diarrhea, 8 were returned to duty within four days; 2 after nine days; 11 cases were transferred to hospital, of which 5 were changed to typhoid fever; 1 furloughed as diarrhea after seven days; and 5 could not be traced. Of 6 cases of dysentery sent to hospital, 1 was furloughed as chills and fever, 3 changed to typhoid fever, and 2 were not traced.

Of the 22 cases diagnosed as tertian malaria, 1 was returned to duty within six days, and 21 cases transferred to hospital, of which 7 were changed to typhoid fever, 1 to continued fever, 1 furloughed after three days as a typhoid suspect, 3 furloughed after four days as tertian malaria, and 9 could not be traced.

Two cases diagnosed as "continued high temperature" were changed in hospital to malaria, but no termination given.

Twenty-one cases diagnosed as continued fever were treated in quarters and returned to duty, as follows: Within four days, 14; six to nine days, 3; fourteen days, 1; twenty-one days, 1; twenty-five days, 1; twenty-eight days, 1.

One hundred and thirty-eight cases diagnosed as continued fever were transferred to hospital, of which 81 were changed to typhoid fever; 1 changed to dysentery; 2 to diarrhea; 14 cases furloughed after periods varying from one to eight days as typhoid suspects; 11 furloughed as malaria after two to six days; 1 furloughed as biliousness; 2 as gastroenteritis; 1 as asthenia; and 25 could not be traced.

Five cases of typhoid fever admitted during August were found in the division hospitals, and 2 cases in State hospitals, none of these having been accounted for by the regimental surgeon. So that to the 2 cases reported by the surgeon we must add 103 cases, thus increasing the number to 105. (Vide chart.)

We are of the opinion that this number falls below the actual number of cases of this disease occurring in the Third New York Infantry during August, since it is quite probable that among the cases furloughed as typhoid suspects and among those that could not be traced there were other cases of typhoid fever.

As regards the occurrence of the disease during this month, we find that cases were admitted prior to the regiment's departure from Camp Alger, while on the march to Thoroughfare Gap, Va., and after arrival at its new station, Camp Meade, Pa.

The regiment remained at Camp Meade from August 30 till September 13, on which date it left for New York, under orders to be mustered out of service.

No regimental report of sick for the month of September is available. We find, however, from the register of sick and wounded for the period September 1 to 11 that there were the following admissions:

Intestinal disorders.....	15
Malarial diseases.....	28
Continued fever.....	88
Typhoid fever.....	6
Total.....	137

Nine cases of diarrhea were returned to duty within three days, 1 after eight days, 1 changed to febricula and furloughed after nine days, 1 discharged the service after five days, 1 changed to typhoid fever, and 2 were not traced.

Of the cases diagnosed as continued fever, 42 cases were returned to duty within five days, 3 changed to dysentery, gastritis, and gonorrhea and furloughed after three, eleven, and twenty-seven days, respectively; 7 furloughed after one to thirteen days, 21 were changed to typhoid fever, and 15 were not traced.

The diagnosis in the 6 cases of typhoid fever reported by the surgeon was confirmed. We thus find that 29 cases of this disease had developed during the first two weeks of September, thus showing that the disease has not been shaken off, notwithstanding the change of station.

The subsequent history of the occurrence of typhoid fever in this regiment could not be followed.

SUMMARY.

Assembled about May 15, 1898, at Camp Black, Long Island.

Arrived at Camp Alger, Va., May 29, 1898.

Had no typhoid fever at State encampment.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 18.

Typhoid fever in the Third New York Volunteer Infantry, by months.

	June.	July.	August.	September.	Total.
Recognized cases.....	1	20	105	29	155
Probable cases.....		5	20	5	30
Total.....	1	25	125	34	185

Total cases of recognized typhoid fever.....	155
Total cases of probable typhoid fever.....	30
Total cases of recognized and probable typhoid fever....	185
Number of deaths from recognized typhoid fever.....	31
Per cent of mortality among recognized cases of typhoid fever.....	20
Percent of mortality among recognized and probable typhoid-fever cases.....	16.75
Left Camp Alger August 3 en route to Thoroughfare Gap, Va.	
Arrived at Camp Meade, Pa., August 29 and 30, 1898.	

SEVENTH ILLINOIS VOLUNTEER INFANTRY.

Second Brigade, Second Division, Second Army Corps.

[Maj Thomas J. Sullivan, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was mustered in at Springfield, Ill., during May, 1898, and was assembled at Camp Tanner, near that city. It remained here from May 19 to May 31.

On the monthly report of sick and wounded the surgeon states that the regiment was quartered part of the time in tents where rain fell daily on a soft clay ground, causing mud to be ankle deep most of the time. The men were later quartered in stalls, rain still pouring in torrents. At the end of one week the command was moved to Machinery Hall, a large building where there was much crowding and heavy drafts and constant dust in the atmosphere, which caused great annoyance and produced many cases of catarrhal inflammation of nose, throat, and bronchial tubes. He also says that malaria was a prevailing disease and was accompanied by very high temperature and delirium.

For the period May 19 to 31, in a mean strength of 50 officers and 974 enlisted men there were 72 admissions, as follows:

Acute diarrhea.....	23
Intermittent fever.....	27
Typhoid fever.....	0
All other causes.....	22

Diarrhea was a trivial affection, as all cases save one went to duty within twenty-four hours; the excepted case lasted five days.

Of malarial cases 13 went to duty within twenty-four hours, 11 within two to five days, 2 lasted six days, and 1 was on sick report for sixteen days.

The regiment reached Camp Alger, Va., on June 3, 1898, direct from Springfield, Ill. In the matter of water supply and disposal of excreta it was placed under the same surroundings as other regiments of the Second Division. Its admissions for the month of June were 233 for all causes, in a mean strength of 50 officers and 1,106 enlisted men. The admissions were divided as follows:

Intestinal diseases.....	161
Intermittent fever.....	23
Typhoid fever.....	0
All other diseases and injuries.....	49

These figures are taken from the regimental reports.

In reference to the diarrheal diseases, the surgeon states that the cases were light and due to imprudence in diet. We find that 69 cases went to duty within twenty-four hours, 64 after two to three days, 22 after four to seven days' treatment, and 6 cases after eight to twelve days.

The cases diagnosed as intermittent fever were also mild in character, 11 cases going to duty within two days, 9 within three to five days; 1 case lasted seven days, and 2 cases were under treatment eleven and twelve days, respectively.

No case suggestive of typhoid fever occurred during the month, and this regiment, therefore, did not import this disease into its Virginia camp.

The regiment continued to occupy its same camp site during July. In an average strength of 50 officers and 1,270 enlisted men there were 169 admissions, as follows:

Intestinal diseases.....	74
Malarial diseases.....	10
Continued fever.....	2
Typhoid fever.....	7
All other causes.....	76

The surgeon states that the diarrheas were, as a rule, mild in character. We find 32 cases returned to duty within twenty-four hours, 21 after two days, 10 within seven days, and 4 within eight to twelve days. Of 7 cases transferred to division hospital no further history could be ascertained.

Of the cases of supposed malarial diseases, 5 were returned to duty within three days, 2 after six days, and 1 after thirteen days; 2 cases sent to hospital were changed to the diagnosis of typhoid fever.

Both cases of so-called continued fever were changed to typhoid in division hospital; so that to the 7 cases of typhoid fever reported by the surgeon we must add 4 cases, as above indicated, making 11 cases for the month of July. The first case in this regiment was admitted from Company F on July 10, followed by a second case in Company D on July 16. (Vide chart.)

Companies A, C, E, G, H, I, L, and M had no cases, while Company B had 5 cases; D, 1; F, 3, and K, 2 cases.

All companies used the same water supply.

The regiment abandoned its camp site at Camp Alger during the first week in August and marched with the other regiments of the Second Division to Thoroughfare Gap, Va. It left the latter place on September 7 for its State encampment at Springfield, Ill., and was mustered out of service on October 20, 1898.

As with the other regiments of this division, typhoid fever increased decidedly in the Seventh Illinois Infantry during the time intervening between its departure from Camp Alger, Va., and its transfer from Thoroughfare Gap, Va.

In a mean strength of 50 officers and 1,256 enlisted men there were 152 admissions, as follows:

Diarrhea.....	12
Malarial fever.....	45
Typhoid fever.....	2
Typhoid suspects.....	83
All other causes.....	10

Besides the cases of diarrhea reported by the surgeon, 8 other cases were found admitted to division hospital during the month, making a total of 20 cases. Of these 12 went to duty within two days, 3 after six days, 1 after nineteen days, 1 was furloughed after two days, and in 3 cases no termination was given.

Of the supposed malarial fevers 23 went to duty within twenty-four hours; after two to five days' treatment, 22.

Of the typhoid suspects, these cases being transferred to hospital, 8 went to duty after two to five days, 6 after six to nine days, 1 after twenty-seven days, 37 were changed to the diagnosis of typhoid fever, and 31 could not be traced.

Thus, to the 2 cases reported by the surgeon we are able to add 37 cases changed to typhoid fever, making for the month 39 cases of recognized typhoid fever. Could the other "suspects" have been traced we feel certain that additional cases would have been found.

For September we have been able to ascertain the date of admission to sick report of only one case of typhoid fever. No report for this or subsequent months is available for examination.

From a report received from the Mercy Hospital, Chicago, 21 cases of typhoid fever were admitted from this regiment during September, but as no dates of original admission to sick report are given these cases have not been charted. They should, however, be added to the total cases of typhoid fever occurring in this regiment. Two of these cases terminated fatally.

This regiment is exceptional, in that one company, H, had no case of typhoid fever during its entire service, and Companies C and E only one each. In Company C no enlisted man contracted typhoid fever. The total cases for the regiment is much below the average.

SUMMARY.

Mustered into service during May, 1898, at Springfield, Ill., and was assembled at Camp Tanner, near that city.

Arrived at Camp Alger, Va., June 3, 1898.

Had no case of typhoid fever at State encampment.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, July 10.

Typhoid fever in the Seventh Illinois Volunteer Infantry by months.

	July.	August.	Septem-ber.	Total.
Recognized cases.....	11	39	22	72
Probable cases.....	1	46	.....	47
Total.....	12	85	22	119

Total cases of recognized typhoid fever.....	72
Total cases of probable typhoid fever.....	47

Total cases of recognized and probable typhoid fever..	119
Number of deaths from recognized typhoid fever.....	2
Per cent of mortality among recognized cases of typhoid fever.	2.77
Per cent of mortality among recognized and probable cases of typhoid fever.....	1.68

Left Camp Alger first week in August en route to Thoroughfare Gap, Va.

Left Thoroughfare Gap on September 7 for State encampment, Springfield, Ill.

SIXTH PENNSYLVANIA VOLUNTEER INFANTRY.

Second Brigade, Second Division, Second Army Corps.

[W. J. Ashenfelter, major and surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was assembled at the State encampment, Mount Gretna, Pa., during the first part of May, 1898, and remained at that point till May 19, on which date it left for Camp Alger, Va., arriving on the same date, and was placed in camp to the north of the Twelfth Pennsylvania Volunteer Infantry.

The same remark heretofore made concerning water supply and disposal of excreta in the case of other regiments of the Second Division will apply to the Sixth Pennsylvania Volunteer Infantry.

The average strength for the month of May was 975 officers and men, and its admissions to sick report, 22, as follows:

Intestinal diseases.....	4
Malarial fevers.....	0
Typhoid fever.....	1
All other causes.....	17

Two of the diarrheal cases were somewhat protracted, lasting six and eleven days, respectively, while the other two were of short duration.

The case of typhoid fever reported by the surgeon was admitted from Company K on May 29, and transferred to First Division Hospital, and thence to Fort Myer on June 16, where the diagnosis was confirmed.

This regiment, therefore, imported one case of typhoid fever into its Virginia camp.

During the following month, in a mean strength of 1,329 officers and men, there were 105 admissions to sick report, namely:

Diarrheal diseases.....	52
Malarial diseases.....	2
Typhoid fever.....	1
All other causes.....	50

These figures are taken from the regimental report.

Of the intestinal diseases, 21 cases were returned to duty within twenty-four hours; after three days, 15; four to seven days, 10; eight to ten days, 2; fifteen days, 1, and no termination given in 2 cases. No case appears to have been confounded with the early stages of typhoid fever.

The 2 cases of malarial disease were returned to duty within forty-eight hours.

The case of typhoid fever was admitted on June 25 from Company G as malaria and transferred to division hospital on June 27 with the same diagnosis, but upon being transferred to the general hospital at Fort Myer on July 7, the diagnosis was changed to typhoid fever, the patient not returning to duty till October 1. So that the general health of this regiment up to the end of June was very satisfactory.

During July this regiment changed its camp site to the vicinity of the Seventh Illinois Volunteer Infantry, and was supplied with water obtained from a driven well. We have been unable to ascertain the exact date of this change of camp.

For the month of July, in a mean strength of 1,324 officers and men, there were 81 admissions, namely:

Intestinal disorders.....	12
Malarial diseases.....	14
Continued fever.....	1
Typhoid fever.....	3
All other causes.....	51

Seven of the 12 intestinal disorders were returned to duty within forty-eight hours; after four days, 2; seven days, 1; ten days, 1; twenty days, 1. These cases were all treated by the regimental surgeon.

Eight of the 14 cases diagnosed as malaria were returned to duty within three days, and 4 others after four to seven days; 2 cases were transferred to general hospital, where the diagnosis was changed in both cases to typhoid fever.

The case reported as one of continued fever was changed in the division hospital to continued high temperature, and at the Fort Myer General Hospital to typhoid fever.

We thus find, in addition to the 3 cases reported by the surgeon in which the diagnosis was confirmed at division hospital, 3 other cases of typhoid fever for this month, as above indicated, making a total of 6 cases for July. These patients were admitted as follows:

Company D, July 3, 18, and 31.....	3
F, July 22.....	1
G, July 18.....	1
M, July 29.....	1

Therefore, only 4 of the 12 companies had cases of typhoid fever during July. The health of this regiment, therefore, up to this date must be considered as fairly satisfactory.

The regiment left Camp Alger August 3 and marched to Thoroughfare Gap, Va., where it arrived six days later. Its mean strength for the month was 1,310 officers and men, and its admissions to sick report only 59, namely:

Diarrheal diseases.....	9
Malarial diseases.....	31
Continued fever.....	1
Remittent fever.....	2
Febricula.....	4
Typhoid fever.....	4
All other causes.....	8

These figures are taken from the regimental report.

Of the intestinal diseases, 6 were returned to duty within forty-eight hours, 1 was furloughed after two days, and 2 were changed to the diagnosis of typhoid fever in the division hospital.

Of the malarial diseases reported by the surgeon, 13 cases were returned to duty within three days; five to nine days, 4; 5 cases were furloughed as malaria after two to ten days' treatment by the surgeon; 8 were changed in division hospital to the diagnosis of typhoid fever, and 1 case reported as transferred to general hospital could not be traced.

The case of continued fever was returned to duty after five days.

Four diagnosed as febricula went to duty after periods varying from one to five days.

There were, in addition to the foregoing cases of typhoid fever, 6 other cases found admitted to division and general hospitals from this regiment for the month of August, which cases were not accounted for by the regimental surgeon; thus we find a total of 20 cases for the month of August. This probably fails to fully express the prevalence of typhoid fever in this regiment, since some of the cases furloughed probably developed into this disease.

The regiment was transferred from Thoroughfare Gap, Va., to Camp Meade, Pa., where it arrived August 25, and remained until September 7, on which date it left the latter camp for the purpose of being mustered out of service.

The mean strength for the month of September is not given, but the admissions are noted as 8, namely:

Intestinal disorders.....	0
Malarial disorders.....	5
Typhoid fever.....	0
All others.....	3

We have been able to ascertain that 2 of the supposed malarial cases were changed to typhoid fever in the division hospital, and have found 3 other cases of typhoid fever admitted to State hospitals during this month from the Sixth Pennsylvania Volunteer Infantry.

There are also reported from State hospitals 2 admissions for October from this regiment.

The number of cases of typhoid fever recorded in this regiment, therefore, from the date of muster in, about the middle of May, to the end of October, reaches only 35, with 6 deaths. This rate of mortality points to the probable occurrence of a larger number. However this may be, the health record of this regiment is a remarkably good one, and we desire to invite attention to a corresponding slight prevalence of malarial disease. Just as in the case of the Seventh Illinois, we find a slight prevalence of so-called malarial disease, with the actual occurrence of comparatively few cases of typhoid fever.

An examination of this regiment's chart will show that in 6 of the 12 companies only 1 case of recognized

typhoid fever is recorded for each, while Company I is accredited with 9 of the 35 cases occurring in the whole regiment during its service.

SUMMARY.

Assembled at State encampment, Mount Gretna, Pa., during first part of May, 1898.

Arrived at Camp Alger, Va., May 19, 1898.

Had no case of typhoid fever at State encampment.

Imported 1 case of typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 25, 1898.

Typhoid fever in the Sixth Pennsylvania Volunteer Infantry, by months.

	May.	June.	July.	August.	Sep- tember.	Octo- ber.	Total.
Recognized cases	1	1	6	20	5	2	35
Probable cases				1			1
Total	1	1	6	21	5	2	36

Total cases of recognized typhoid fever 35
Total cases of probable typhoid fever 1

Total cases of recognized and probable typhoid fever. 36
Number of deaths from recognized typhoid fever 6
Per cent of mortality among recognized cases of typhoid fever 17.14
Per cent of mortality among recognized and probable cases of typhoid fever 16.66

Left Camp Alger August 3, en route to Thoroughfare Gap, Va.

Arrived at Camp Meade, Pa., August 25, 1898.

FOURTH MISSOURI VOLUNTEER INFANTRY.

Second Brigade, Second Division, Second Army Corps.

[Abstract of surgeon's statement—Maj. H. D. Kneedler, U. S. Volunteers.]

The regiment was mustered into service at St. Louis, Mo., on May 14, 1898, and was camped on the Government reservation at Jefferson Barracks till May 25. Water was obtained from the city supply. Garbage and excreta were deposited in pits and contents covered twice a day with earth. No sickness occurred here except measles. There was no typhoid fever nor diarrhea.

The regiment arrived at Camp Alger, Va., on May 27, and went into camp near and south of that of the Twelfth and Thirteenth Pennsylvania Volunteer Infantry. The whole camp site had been used for the purpose of defecation by the men of these regiments and those of the First Rhode Island Infantry. The ground was thoroughly cleansed and the refuse burned. This camp was occupied until June 6, during which time water was obtained from a spring, also used by the Twelfth and Thirteenth Pennsylvania Infantry, and for a few days from a driven well belonging to these regiments.

No typhoid fever occurred in this first camp, but a case occurred on June 23, in the second camp. In this camp water was obtained from a driven well, and pits

for excreta were located about 200 yards from the mess tents. Numerous "shacks" were located near the regimental streets where all manner of drinks were sold. During July a number of cases of typhoid fever occurred, these cases being confined largely to one Company, K, while the other companies had but few cases. This outbreak in Company K was attributed to the fact that the men of this company slept on the ground, while the other men were raised from the ground. The men of all companies were much crowded in the tents, the companies having been increased from 82 to 106 men after arrival at Camp Alger.

The regiment left Camp Alger on August 20, going direct to Camp Meade, Pa., by rail. Typhoid fever has decreased since reaching the latter camp, but cases still occur at the end of September.

REMARKS BY THE BOARD.

For the month of June, in an average strength of 47 officers and 1,274 enlisted men, there were 63 admissions, as follows:

Diarrhea.....	40
Malaria.....	4
Typhoid fever.....	2
All other causes.....	17

Twenty-one cases of diarrhea were returned to duty within three days; four to seven days, 13; nine days, 3; eleven days, 2; fifteen days, 1.

The duration of the malarial cases was: Three days, 1; six days, 1; nine days, 1; eighteen days, 1.

The first case of typhoid fever was admitted from Company B, sixteen days after arrival at Camp Alger. A second case occurred on June 21 in Company C. Both of these cases terminated fatally.

For the month of July, the regiment occupying the same camp site, in a mean strength of 47 officers and 1,263 enlisted men, there were 174 admissions, as follows:

Intestinal diseases.....	48
Malarial diseases.....	13
Typhoid fever.....	0
All other causes.....	113

Of the diarrheal diseases, there were returned to duty within four days, 39 cases; after eight days, 2; thirteen days, 1; sixteen days, 1; thirty-six days, 1. Two cases transferred to division hospital were diagnosed as typhoid fever. Two cases had no termination given.

Eleven cases of malarial disease were treated in quarters by the surgeon and returned to duty, as follows: One to five days, 6; six to ten days, 3; nineteen days, 1; forty days, 1. Two cases transferred to hospital were furloughed at end of thirty-one and thirty-six days, diagnosis unchanged.

Besides the malarial cases reported by the surgeon we find a number of men belonging to this regiment

who were admitted to the Second Division Hospital during July, viz:

	Cases.
Continued fever.....	10
Continued high temperature.....	7
Febricula.....	7

Of these 24 cases not accounted for by the regimental surgeon there were returned to duty within seven days, 14; after eight to twelve days, 2; thirty-three days, 3; changed to typhoid fever, 4; not traced, 1.

The surgeon also states on the July report that 12 cases were sent to the division hospital as typhoid suspects, but that no returns were made to him confirming the diagnosis and hence these cases do not appear on the regimental report. We have been able to trace 11 of these cases which were changed to the diagnosis of typhoid fever in division hospital, thus giving a total of 17 recognized cases of typhoid fever for July. We would be inclined to add to these, 5 cases diagnosed as malarial or continued fever and which lasted from nineteen to thirty-three days.

We observe that 8 cases of typhoid fever occurring during the last six days of the month in Company K, and that six companies, viz, A, D, G, H, I, and L, had no cases during July. The contamination of the general water supply is thus effectually excluded.

The regiment did not change its camp till August 20, on which date it left for Camp Meade, Pa.

In a mean strength for the month of August of 46 officers and 1,243 enlisted men there were 137 admissions, as follows:

Intestinal disorders.....	46
Malarial diseases.....	44
Typhoid fever.....	4
All other causes.....	43

Forty-two cases of intestinal disease were treated in quarters by the surgeon and resulted as follows: To duty within five days, 32; six to eleven days, 2; furloughed after four days, 2; and no termination given in 6 cases. Of 4 cases transferred to division hospital, 2 were sent to duty within three days and 2 changed to the diagnosis of typhoid fever.

Of malarial diseases, 18 cases were treated by the surgeon, with the following result: To duty within six days, 8; eleven days, 1; forty-seven days, 2; eighty-six days, 1; furloughed after four days, 3; and no termination given in 3 cases. Twenty-two cases were transferred to division hospital. Of these, 4 were sent to duty within eight days; after thirteen days, 2; twenty-nine to forty-two days, 3; furloughed on eleventh day, 1; changed to typhoid fever, 4; and 8 could not be traced.

There were found besides these, 24 cases admitted to the Second Division Hospital under the diagnosis of malarial or continued fever and not reported by the surgeon. Eight of these cases were changed to the

diagnosis of typhoid fever; 8 were returned to duty within seven days; 1 was furloughed on the tenth day as continued fever; and in 7 cases no termination was given.

There were also found in general and State hospitals 12 additional cases of typhoid fever admitted from this regiment during August, thus bringing the cases for this month to 30, figures which probably fall short of the real number by not less than 10 cases.

We note that 10 cases were recorded prior to the regiment's departure from Camp Alger (August 20), and 18 cases after arrival in its new camp, these being, it would seem, infections incurred in the old camp.

We again note the same unequal distribution of cases—that Companies G, I, and M had no cases, while Company K again leads with 12 cases, and Company D has 5 cases.

As this board had not the opportunity of inspecting this regiment until during the first week in October, when typhoid fever had almost subsided, it was unable to elicit any facts bearing upon the probable origin of the outbreak of 20 cases of typhoid fever in Company K during the latter part of July and August.

As bearing upon the occurrence of milder typhoid infections, this company again affords a striking illustration. (See chart.) Until the epidemic of typhoid fever began Company K was quite free of supposed malarial affections, but coinciding in point of time with the outbreak and continuance of typhoid fever in this company, we find 7 mild fevers of the following duration: Three days, 2; five days, 2; eight days, 2; eleven days, 1; and 4 fevers of longer duration, viz, twenty-eight days, 1; thirty days, 1; forty-seven days, 2.

We can hardly doubt that the last 4 cases, diagnosed as malaria, were other than typhoid fever, and we have every reason to believe that the shorter fevers, diagnosed as intermittent fever or malaria, were examples of milder infections in more resistant individuals, since this occurrence of milder fevers was coincident with the outbreak of typhoid fever, and the former subsided with the disappearance of the latter.

We have already stated that this regiment arrived at Camp Meade, Pa., on August 20, and we have recorded the occurrence of 18 cases of typhoid fever during the last eleven days of August, cases probably due to infection incurred in their Virginia camp. From this time, September 1, we should expect a marked diminution in the number of cases of this disease.

Continuing the history of the occurrence of fevers in the regiment, we find during September, in a mean strength of 35 officers and 1,004 enlisted men, 159 admissions to sick report, as follows:

Intestinal disorders.....	18
Malarial diseases.....	56
Typhoid fever.....	11
Other causes.....	74

Fourteen cases of intestinal disorder were treated by the surgeon, with the following result: Duty after two to five days, 4; thirteen days, 2; twenty-seven days, 1; furloughed after periods of three to fourteen days, 4, and no termination given in 3 cases. Of 4 cases sent to hospital, 2 were returned to duty within two days, and 2 furloughed after sixteen and twenty-seven days as chronic diarrhea.

Four cases of malarial disease were treated by the surgeon and returned to duty within seven days. Fifty-two cases were transferred to hospital with the following result: Returned to duty after two to nine days, 10; furloughed after two to eight days' treatment as malaria, chills and fever, and continued fever, 9; after nine to fifteen days as malaria, 6; after thirty-five to forty-one days as continued fever, 2; changed to the diagnosis of typhoid fever, 25.

There were also found admitted to the division hospital 14 cases diagnosed as intermittent fever or malaria, of which no disposition was given.

Of the 11 cases of typhoid fever diagnosed by the surgeon, 3 were changed in the division hospital to malaria and returned to duty within seven days, and in 8 cases the diagnosis was confirmed. To these 33 cases of typhoid fever should be added 25 cases of this disease which were found to have been admitted to division or State hospitals during September but not accounted for by the regimental surgeon.

Thus we find a total of 58 cases for September as compared with 30 cases for August. In other words, the anticipated reduction of cases in the new camp has been converted into an actual and considerable increase. We note that 44 cases occurred during the first half, as against 14 for the last half of the month, and that no cases are recorded for the last six days of September. We also observe that whereas two companies—G and M—had no cases during August, and the other companies—C, I, and L—had only 1 case each, the latter companies, as well as G and M, have shown an increase during September, and that the disease has only decreased in Companies H, D, and K, the two latter companies having the largest number of cases during August.

The following table shows the comparative prevalence of the disease in the old and new camps:

Company.	Cases in August.	Cases in September.
A.....	2	5
B.....	2	5
C.....	1	4
D.....	5	1
E.....	2	5
F.....	2	6
G.....	0	6
H.....	2	1
I.....	1	7
K.....	12	4
L.....	1	8
M.....	0	4
Staff.....	0	2
Total.....	30	58

The prevalence of typhoid fever in Companies D and K during August had probably led to more stringent sanitary precautions in these companies, and hence to marked reduction in cases as compared with other companies in the regiment.

This regiment serves well the purpose of an illustration that typhoid fever when once established in a regiment is not always to be gotten rid of by a change of camp site, even though this may involve removal from one State to another.

In a mean strength for October of 37 officers and 964 enlisted men the admissions were only 55, consisting of—

Diarrheal diseases	13
Malarial diseases	14
Typhoid fever.....	4
Other causes	24

In addition to the cases of typhoid fever reported by the surgeon, we have been able to find 10 cases in division and State hospitals, making the total cases for October to number 14. In other words, during the month there has been a marked reduction in both malarial and typhoid fevers.

The same remark applies to the month of November, with 14 cases of malarial diseases and only 6 cases of typhoid fever. No case of the latter disease occurred after November 17.

The regiment left Camp Meade, Pa., November 14 and went to Camp Wetherill, S. C., where it arrived on November 17. The surgeon remarks on the November report of sick that there has been during the month comparatively little sickness, and that men who were previously furloughed from the Second Division Hospital were returning in good condition.

No cases of typhoid fever occurred during December.

SUMMARY.

Mustered into service May 14, 1898, at St. Louis, Mo.

Arrived at Camp Alger, Va., May 27, 1898.

No typhoid fever in State camp.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 12.

Typhoid fever in the Fourth Missouri Volunteer Infantry, by months.

	June.	July.	August.	September.	October.	November.	Total.
Recognized cases	2	17	30	58	14	6	127
Probable cases	1	9	11	8	.....	.....	29
Total.....	3	26	41	66	14	6	156

Total cases of recognized typhoid fever	127
Total cases of probable typhoid fever	29

Total cases of recognized and probable typhoid fever.....	156
Number of deaths from recognized typhoid fever	18
Per cent of mortality among cases of recognized typhoid fever	14.17
Per cent of mortality among cases of recognized and probable typhoid fever.....	11.53
Left Camp Alger August 20, 1898, for Camp Meade, Pa., direct.	

NINTH OHIO BATTALION VOLUNTEER INFANTRY (COLORED.)

Second Brigade, Second Division, Second Army Corps.

[Abstract of surgeon's statement, Lieut. William G. Wren, assistant surgeon, U. S. Volunteers.]

Three companies of this battalion were mustered in on the 14th of May at Columbus, Ohio; the fourth company on the 8th of August, 1898.

The command consisted of 13 officers and 205 enlisted men, and arrived at Camp Alger, Va., on May 20, and was placed in camp near the headquarters of the Second Army Corps. Its water supply was obtained from a spring, and its fecal disposal was by means of shallow pits, the contents of which were covered daily with dry earth. Water was also obtained from the well at division headquarters.

No case of typhoid fever developed at Columbus, Ohio, and there was no sickness whatever at that place.

The battalion did not import typhoid fever into its Virginia camp, no case of this disease having developed until July 23, when the first case was diagnosed. This patient was kept some time in quarters prior to being transferred to division hospital.

REMARKS BY THE BOARD.

For the period May 20 to 31 there were 10 admissions to sick report, namely:

Intestinal disorders.....	3
Malarial disease.....	0
Typhoid fever.....	0
Other causes.....	7

The cases of diarrhea were returned to duty within twenty-four hours.

For the month of June, in a strength of 13 officers and 319 enlisted men, there were 29 admissions, namely:

Intestinal diseases.....	9
Bilious fever.....	1
Malarial fever.....	0
Typhoid fever.....	0
All other causes.....	19

The intestinal cases were returned to duty within forty-eight hours.

The case of bilious fever lasted one day. The health of this command, therefore, to the end of June was satisfactory.

The battalion retaining its camp site in July, in a mean strength of 16 officers and 420 enlisted men there were 101 admissions to sick report, namely:

Intestinal disorders.....	16
Malarial disease.....	0
Typhoid fever.....	4
All other causes (consisting largely of cases of vaccinia).....	81

Of the intestinal disorders 9 were returned to duty within forty-eight hours; 3 after four to seven days; after fifteen days, 1; twenty-seven days, 1; thirty-one days, 1; and 1 case admitted as acute diarrhea was

changed by the surgeon afterwards to typhoid fever. This case is included in the 4 cases above referred to.

Of the 3 remaining cases of typhoid fever reported by the surgeon, the diagnosis in 2 was confirmed at the division hospital, and in the fourth case was changed to remittent fever, the patient being returned to duty after eighteen days' treatment in hospital. We are inclined to regard this case also as one of mild typhoid infection.

The date of the first occurrence of typhoid fever in this battalion was July 19, when a patient was admitted from Company C with the disease, followed by a second case on July 23 from Company B, and this by still another case on July 31 from Company D. The case reported as remittent fever, but which we would rather regard as a mild typhoid infection, was admitted from Company C on July 23. Typhoid fever had therefore appeared in this battalion during the latter part of July, the cases so far being sporadic ones.

The battalion abandoned its camp site at Alger on August 16, and went direct by rail to Camp Meade, Pa., where it arrived August 17.

For the month of August, in a mean strength of 16 officers and 424 enlisted men, there were 89 admissions to sick report, namely:

Intestinal diseases.....	8
Undetermined fever.....	4
Ephemeral fever.....	2
Malarial fever.....	0
Typhoid fever.....	5
All other causes.....	70

The intestinal cases were of short duration, except 1 case which lasted twelve days.

The cases of undetermined fever were returned to duty within four days.

The same remark applies to the cases of ephemeral fever.

No case of typhoid fever appears to have occurred during the sixteen days of August, when the regiment was still on its old camp site at Camp Alger, Va. Between the 17th and the 31st of the month 6 cases occurred, 5 of which are included in the cases reported by the surgeon. Five of these cases occurred so soon after arrival at Camp Meade that the infection must be traced to the old camp site at Alger. Three of the 6 cases occurred in Company A; 2 in Company B, and 1 in Company D.

The site occupied by the battalion at Camp Meade was elevated, well drained, and in every respect suitable. The battalion remained on this camp site from August 17 till November 14.

During September, in a mean strength of 16 officers and 418 men, there were 68 admissions to sick report, viz:

Intestinal disorders.....	3
Malarial fever, mild.....	22
Undetermined fever.....	2
Typhoid fever.....	9
All other causes.....	32

These figures are taken from the monthly sick report. Intestinal cases were returned to duty within twenty-four hours.

The 2 cases of undetermined fever were returned to duty at the end of four and eight days, respectively.

The duration of the malarial fevers, mild, were as follows: To duty within two days, 4; three to five days, 3; six to eight days, 7; nine to ten days, 4; thirteen to fifteen days, 2; twenty-one days, 1; thirty-six days, 1. These patients were treated in the regimental hospital.

Two cases of malarial fever, however, were changed in the division hospital to the diagnosis of typhoid fever, and 1 patient transferred as measles was afterwards changed also to the diagnosis of typhoid fever. We thus find 3 other cases of typhoid fever in addition to the 9 cases reported by the surgeon, making a total of 12 cases of this disease in this battalion for the month of September. Six of these cases were confined to Company A and 4 to Company D.

With regard to the occurrence of typhoid fever at Camp Meade, the battalion medical officer was inclined to the opinion that the disease in some of these cases was contracted by individual soldiers purchasing milk from a farmhouse at which one or more typhoid fever cases were then present. It appears, however, that the medical officer, as well as other officers of the battalion, had been in the habit of using milk from the same source without contracting the disease, so that this origin is at least doubtful, especially as the cases in the battalion antedated those at the farmhouse.

During October the mean strength of the battalion was 16 officers and 404 enlisted men, and the admissions to sick report were 58, as follows:

Intestinal disorders.....	10
Undetermined fever.....	1
Remittent fever.....	3
Malarial fever, mild.....	7
Typhoid fever.....	7
All other causes.....	30

The intestinal cases were returned to duty after a brief interval, with the exception of 2 cases reported as chronic indigestion, in which no termination was given.

The case of undetermined fever was still reported sick on December 31, after an interval of eighty-seven days. This case must be considered as one of typhoid fever.

The cases of remittent fever were returned to duty after twelve, twenty, and twenty-three days. The same cases are designated by the medical officer on the November report as malarial fever, pernicious. We believe these 3 cases to be those of typhoid infection, although we have not charted them with the battalion cases of typhoid fever.

Of the 7 cases diagnosed as malarial fever, mild, 1 was returned to duty within twenty-four hours; 1 was furloughed after one day's treatment; 2 were returned to duty after seven and ten days; 1 after nineteen days;

1 changed to typhoid fever, and 1 to continued fever in a State hospital. The duration in the latter cases we have been unable to determine.

In addition to the 7 cases of typhoid fever reported by the surgeon in which the diagnosis was confirmed, we thus find 2 other well-marked cases of this disease, making a total for this month of 9 cases.

The battalion changed its camp site for the third time on November 14, going South with the other organizations of the Second Corps.

During the month of November, in a mean strength of 16 officers and 418 enlisted men, there were 54 admissions, as follows:

Intestinal disorders.....	4
Malarial fever.....	11
Typhoid fever.....	2
Typhoid suspects.....	2
Other causes.....	35

The intestinal disorders were of short duration.

The cases diagnosed as malarial fever resulted as follows: Returned to duty after one to three days, 2; twenty-six to twenty-nine days, 2; still remaining on sick report after twelve to twenty days, 3; changed to typhoid fever, 2; died, 2. Although the fatal cases, as well as the cases lasting twenty-six and twenty-nine days, were diagnosed by the battalion medical officer as pernicious malarial fever, we are decidedly of the opinion that these should be regarded as cases of typhoid infection. The probability also points strongly to the typhoid character of the cases remaining sick in hospital after twelve to twenty days. These cases were likewise diagnosed as pernicious malarial fever.

The diagnosis was confirmed in the 2 cases of typhoid fever reported by the surgeon and in 1 of the typhoid suspects also. We are thus able to report 9 cases of typhoid fever in this command during the month of November. All of these may be considered as infections incurred prior to departure from Camp Meade, Pa.

Among the 47 admissions from all causes during December no intestinal disorder is recorded, and only 1 case is reported as intermittent malarial fever, of two days' duration. No case of typhoid fever occurred.

The total number of cases of typhoid fever for this battalion was 39, with 5 deaths.

It is important to observe that in this organization, consisting of colored troops, supposed malarial diseases began to be prevalent coincident with the appearance of typhoid fever, were at their height during the months when typhoid fever was most prevalent, and disappeared with the subsidence of the latter disease.

SUMMARY.

Three companies mustered into service May 14, 1898, at Columbus, Ohio; the fourth on August 8, 1898.

Arrived at Camp Alger, Va., May 20, 1898.

Had no case of typhoid fever at State encampment.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, July 19, 1898.

Typhoid fever in Ninth Ohio Battalion Volunteer Infantry, by months.

	July.	August.	Sep-tember.	Octo-ber.	Novem-ber.	Total.
Recognized cases.....	3	6	12	9	9	39
Probable cases.....	1	.....	5	5	4	15
Total	4	6	17	14	13	54

Total cases of recognized typhoid fever.....	39
Total cases of probable typhoid fever.....	15

Total cases of recognized and probable typhoid fever.....	54
Number of deaths from recognized typhoid fever.....	5
Per cent of mortality among recognized cases of typhoid fever	12. 82
Per cent of mortality among recognized and probable typhoid fever cases	9. 25

Left Camp Alger August 16, 1898. Arrived at Camp Meade, Pa., August 17. Left Camp Meade for the South November 14.

THIRD MISSOURI VOLUNTEER INFANTRY.**Third Brigade, Second Division, Second Army Corps.**

[Jabez N. Jackson, major and surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was mustered into service May 10, 1898, at Jefferson Barracks, Mo., and remained in camp at that point till May 26, on which date it left for Camp Alger, Va., arriving May 29.

No case of typhoid fever appears to have occurred at Jefferson Barracks.

Like other regiments, its water supply during the first weeks of its Virginia encampment was obtained from shallow springs and afterwards from a deep driven well. Its fecal disposal was by means of open pits, the contents of which were covered daily with earth.

The sick report of this regiment begins on May 10. In a mean strength of 50 officers and 972 enlisted men, there were 56 admissions, as follows:

Intestinal disorders.....	28
Tertian intermittent.....	5
Other causes.....	23

The diarrheas and malarias were all of short duration.

No case of typhoid fever was imported by this regiment into its Virginia camp.

With the exception of the prevalence of diarrheal diseases, the health of the regiment remained good during June. Mean strength: Officers, 50; enlisted men, 994; admissions, 274, as follows:

Diarrheal diseases.....	157
Tertian malarial.....	57
Typhoid fever.....	0
All other causes.....	60

One hundred and thirty-two cases diagnosed as acute dysentery were returned to duty within three days. Ten cases lasted from four to seven days; 2 cases were under treatment from ten to nineteen days; in 2 cases the diagnosis was changed to typhoid fever, while in 11 cases no termination was given.

Of the cases diagnosed as tertian malaria, 17 went to duty after twenty-four hours; 20 within two days; 10 within three to five days; after eleven days, 1; and 1 case sent to hospital was changed to the diagnosis of typhoid fever. In 8 cases no termination was given.

Three cases of typhoid fever occurred, therefore, during June, as follows: Company M, June 20, 1 case; Company B, June 21, 1 case; and Company A, June 26, 1 case. One of these cases was sent to hospital as tertian intermittent fever, and 2 cases as acute diarrhea.

A case admitted from Company C on June 7 as typhoid fever was transferred to the general hospital at Fort Myer and there diagnosed as acute meningitis.

The same camp site was occupied during July. Mean strength: Officers, 50; enlisted men, 1,212; admissions, 190, as follows:

Intestinal disorders.....	75
Tertian intermittent.....	49
Typhoid fever.....	8
All other causes.....	58

Diarrheal disorders gave the following result: To duty within three days, 50; within ten days, 6; thirty days, 1; furloughed on the third day, 1; changed to diagnosis of typhoid fever, 4; and no termination given in 13 cases.

In addition to the cases of malarial disease reported by the surgeon, 21 cases were treated in the division hospital, making a total of 70 cases for the month. Of these 43 went to duty within three days; 9 within seven days; 3 were returned to the regiment after eight days in hospital as cases of continued fever; 1 case lasted nine days; 1 was sick thirty-one days; 2 were changed in hospital to the diagnosis of typhoid fever; and in 11 cases no termination was given.

One case of typhoid fever not accounted for by the regimental surgeon was found in the division hospital, thus increasing the cases to 16 for July. (Vide chart.)

Companies C, H, L, and M had no cases, while Company D had 7 cases and Company F 3, so that the disease was quite unequally distributed.

Between July 25 and August 5 the First Battalion, consisting of Companies C, D, E, and F, was at Difficult Run, Va., for the purpose of rifle practice. August 3 the Second and Third Battalions, consisting of Companies A, B, G, H, I, K, L, and M, left Camp Alger and marched to Thoroughfare Gap, Va., with the other regiments of the Second Division, arriving at that place on August 9. From this point these battalions went by rail to Camp Meade, Pa., August 20.

The First Battalion remained in its old camp at Alger till August 17, when it was also transferred by rail to Camp Meade.

Mean strength for August: Officers, 50; enlisted men, 1,204. Admissions, 302, as follows:

Intestinal disorders.....	91
Tertian malaria.....	63
Typhoid fever.....	39
All other causes.....	109

Forty-three cases of diarrhea were returned to duty within three days; 6 within eight days; 3 furloughed after one to seven days; 9 changed to the diagnosis of typhoid fever, and in 30 cases no termination was given.

In addition to the cases of malarial disease reported by the surgeon, 21 other cases were found admitted to the Second Division Hospital, making 84 cases for August. Of these, 47 were returned to duty within three days; after four to seven days, 14; eight days, 1; thirteen days, 1; furloughed after three to five days, 4; changed to diagnosis of typhoid fever in division hospital, 6, and in 11 cases no termination was given.

Three of the cases of diarrhea and 5 of the cases of tertian malaria changed to typhoid fever were included among the 39 cases reported by the surgeon, thus leaving 6 cases diagnosed as acute diarrhea, 1 case diagnosed as tertian malaria, and 1 case found in division hospital to be added to his cases, thus making 47 cases of typhoid fever for August. These cases were largely confined to the First and Third Battalions, which had 18 and 19 cases, respectively, while the Second Battalion furnished only 9 cases, and this although the Second and Third Battalions were placed under similar conditions, both of these accompanying the Second Division on its march to Thoroughfare Gap.

In other words, the Third Battalion on its march fared no better as regards the prevalence of typhoid fever than the First Battalion, which remained behind at the old infected site at Camp Alger. The disease also increased in the Second Battalion while on the march.

An examination of the regimental chart for August will show that 17 cases occurred during that portion of the month when the regiment was encamped at Camp Meade, Pa., and that the disease continued to prevail during September, especially during the first half of that month, 17 cases being recorded for this period against 6 cases for the last half of September; that is to say, typhoid fever continued to prevail, although to a lesser extent, for a period of three weeks after reaching an entirely new camp in an apparently healthy location, with an unobjectionable water supply. More than this, the regiment having left Camp Meade, Pa., on September 6, under orders to be mustered out of service, 6 cases of typhoid fever are still recorded for the last half of the month, and 9 other cases occurred during the furlough period, September 18 to October 17. These cases, although charted under the dates given in the report of sick, probably belong to the latter half of September.

We observe that with the reduction of typhoid fever in the regiment during September there is also a like falling off of supposed malarial diseases.

This regiment was mustered out of the service November 7, 1898.

SUMMARY.

Mustered into service May 10, 1898, at Jefferson Barracks, Mo.
Arrived at Camp Alger, Va., May 29, 1898.
Had no typhoid fever at State encampment.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 20, 1898.

Typhoid fever in the Third Missouri Volunteer Infantry, by months.

	June.	July.	August.	Sep-tember and Oc-tober.	Total.
Recognized cases	3	15	47	32	97
Probable cases	1	1	1	.....	3
Total	4	16	48	32	100

Total cases of recognized typhoid fever..... 97

Total cases of probable typhoid fever..... 3

Total cases of recognized and probable typhoid fever.. 100

Number of deaths from recognized typhoid fever..... 9

Per cent of mortality among recognized cases of typhoid fever..... 9.27

Per cent of mortality among recognized and probable cases of typhoid fever..... 9.00

The Second and Third Battalions left Camp Alger August 3 en route to Thoroughfare Gap, Va.

Left Thoroughfare Gap for Camp Meade, Pa., August 20, 1898.

The First Battalion left Camp Alger for Camp Meade, Pa., August 17, 1898.

FIRST RHODE ISLAND VOLUNTEER INFANTRY.

Third Brigade, Second Division, Second Army Corps.

[Abstract of surgeon's statement—Maj. L. S. Hill, U. S. Volunteers.]

The regiment was mustered into service at Quonset Point, Rhode Island, the State encampment, between May 8 and 15. The water supply was obtained from a deep well and was of excellent quality. Excreta were deposited in pits and covered occasionally with dry earth. There was but little sickness at this camp, and no case of typhoid fever occurred.

The regiment reached Camp Alger, Va., May 28, 1898, and was placed in camp on the crest of a hill on the left flank of the Fourth Missouri Infantry. Water was at first obtained from a small run near by. This supply was stopped as soon as possible, water being obtained from a spring in front of the Fourth Missouri and from a well over the hill. The regiment remained in this camp about two weeks. A few days before removing camp the water supply was obtained from a driven well sunk by the engineer department. Sinks for excreta were located about 100 yards from the mess tents. There were numerous defecations scattered over the ground when the regiment first went into camp.

About the 5th of June the regiment moved to a camp three-fourths of a mile south of the Campbell house. Water was obtained from a spring, from a farmhouse well, and from the well of the Second Tennessee Infantry. The surgeon was taken sick with dysentery, and left Camp Alger June 13 and did not return until July 28. Up to the time of his departure there had been no typhoid fever. The disease began about July 1. The first case was a private of Company I, a resident of Alexandria, Va., who visited that city and contracted the

disease. He died at Fort Myer. In the same tent 6 cases of typhoid fever developed on the following dates: July 1, 16, 23, and 25.

Company I had more cases than other companies, there being three deaths in this company from typhoid fever during July. At the time of the regiment's departure from Camp Alger, August 3, all of the companies were affected.

The command marched through Virginia by way of Manassas and Bristow Station to Thoroughfare Gap. From this point the regiment was transported by rail to Camp Meade, Pa., reaching the latter point August 23. The march from Camp Alger, Va., to Thoroughfare Gap was a trying one, the weather being very warm at first, followed by heavy rains and bad roads. In fording Broad Run the men were wet to their waists. The camps were wet, with only dog tents for protection.

A large number of cases of fever developed, especially at Thoroughfare Gap, due to exposure. The surgeon could not give this fever any particular name. It was, however, a continued fever that would last eight or ten days and then subside. It was neither a typical typhoid nor typical malarial fever.

Many cases of fever were transferred to division hospital after arrival at Camp Meade, and this continued during the first half of September. As to the number of these fevers, which afterwards developed into typhoid fever, the surgeon could express no opinion. With the flooring of tents and better sanitary conditions, there was a decided decrease of fever cases during the last half of September.

REMARKS BY THE BOARD.

Sick report began with May 14, 1898. Average strength: Officers, 46; enlisted men, 908. Admissions, 12. Malarial fevers of one day's duration contributed 7 cases; other causes equally trivial; no typhoid fever. Regiment arrived at Camp Alger, Va., May 28, 1898.

Strength for June: Officers, 46; enlisted men, 1,225. Admissions, 50, as follows:

Diarrhea	17
Intermittent fever	7
Typhoid fever	0
Other causes and injuries	26

Diarrheas were of short duration, except 1 case which was furloughed and not further traced.

No fever lasted longer than three days.

The health of the First Rhode Island Volunteer Infantry, therefore, for the month of June was very good.

On the July sick report the surgeon remarks:

Typhoid fever prevailed at Camp Alger. The regiment had an insufficient water supply at first, and without doubt polluted water was at times used. Frequent filling up of the sinks, free use of lime, and isolation of the suspected cases were among the means adopted for the prevention of the disease.

Strength for July: Officers, 44; enlisted men, 1,220. Admissions, 143, as follows:

Acute diarrhea	18
Acute dysentery	5
Malarial fever	35
Typhoid fever	26
All other causes	59

The cases of diarrhea were of short duration, except 2 cases which were under treatment eighteen and twenty-one days, respectively. One case of dysentery lasted twenty-seven days. No intestinal disorders were sent to division hospital.

Twenty-seven cases diagnosed as malarial fever were of less than three days' duration; four to six days, 3; eight days, 1; eleven days, 1; seventeen days, 1; twenty-nine days, 1. In 1 case duration was not given.

The earliest cases of typhoid fever appeared on July 12, 2 cases being reported from Company C, 1 from Company D, and 1 from Company I on that date, followed by 2 cases, 1 from Company C and 1 in Company E, on July 16.

In addition to the 26 cases of typhoid fever reported by the surgeon, we find 1 case of malarial fever changed to typhoid fever in the division hospital and 2 other cases of this disease in the hospital not accounted for by the surgeon, making a total of 29 cases for July.

The following table shows the cases by company and date of occurrence for July:

Date.	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
July 12.....			2	1					1					4	
16.....			1		1									2	
18.....				1						1				2	
20.....									1					1	
21.....				1										1	
22.....	1					1			2					4	
23.....				1	1				2				1	5	
27.....				2	1				1					4	
29.....								1	1	1				3	
30.....								1						1	
31.....		1										1		2	
Total ...	1	1	3	6	3	1	1	1	8	2	0	1	1	29	

The regiment left Camp Alger August 3 with the Second Division, Second Army Corps, en route for Camp Meade, Pa.

On the August sick and wounded report the surgeon states that the regiment was constantly on the march for the greater part of the month. "Fever prevailed, a continued fever, for ten days or two weeks, with no decided type, excepting in some instances a pure malarial or typhoid type. It is a curious fact that the three men who died of typhoid fever belonged to the same company and occupied the same or contiguous tents. One death from the same disease and same tent was reported by me for July. Frequent changes of camp and rigid sanitary conditions were among the means adopted to stamp out the disease."

Strength for August: Officers, 46; enlisted men, 1,245. Admissions, 173, as follows:

Acute diarrhea	16
Dysentery	9
Malarial fever	11

"Fever"	87
Typhoid fever.....	3
Other causes	47

The diarrheas were of short duration. Six cases of dysentery treated by the surgeon were returned to duty within twelve days. Of 3 cases transferred to the division hospital, 1 was diagnosed as typhoid fever, 1 transferred nine days later to St. Agnes Hospital, Philadelphia, as a typhoid suspect, and 1 could not be traced. Of the cases diagnosed as malarial fever, 9 were treated by the surgeon and returned to duty, as follows: After one to three days, 6; four to six days, 2; seventeen days, 1; 2 were transferred to division hospital, and both changed to typhoid fever.

Twenty-nine cases diagnosed as "fever" were treated by the surgeon and returned to duty, as follows: One to four days, 9; five to eight days, 10; ten to thirteen days, 5; fifteen days, 4, and twenty days, 1.

Fifty-eight cases diagnosed "fever" were transferred to division hospital; 16 of these could not be traced. Of 42 remaining cases, 1 was furloughed after six days, diagnosed "malaria;" returned to regiment as remittent fever after eight days, 3; ten to 16 days, 3; thirty to forty days, 6; forty to seventy-three days, 3, and 26 were changed to the diagnosis of typhoid fever.

In addition to the foregoing, 19 other cases of typhoid fever admitted for August have been found in division and civilian hospitals which were not included by the surgeon in his report. Thus we find a total of 51 cases of this disease for August, as follows:

Date.	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
August 1.....			1						1					2	
2.....									3					3	
3.....				1		1			3					2	
5.....	1													1	
6.....				1										1	
8.....			1						1					2	
9.....				1										1	
10.....							1				1			2	
11.....									1		1			2	
13.....			1								1			2	
14.....	1													1	
15.....	1										1			1	
18.....						2								2	
19.....			1		1	1								3	
20.....	1	1												2	
24.....	1	1							1					3	
25.....		5				1			1		2	2		12	
27.....		1										1	1	3	
30.....				1										1	
31.....	1	1					2					1		5	
Total	6	9	4	4	1	5	4	0	8	0	5	4	1	51	

The First Rhode Island Infantry arrived at Camp Meade, Pa., on August 23, 1898.

Concerning the health of the regiment for the month of September the surgeon remarks:

A form of fever has prevailed in this regiment of no pronounced type for the most part, except as to typhoid fever, which has been on the decrease since reaching camp. We have called the fever which has been most prevalent "malaria," in order to give it a name, yet very few of these cases have yielded to quinine. It is from three to ten days in duration. Most of the cases are over within a week. No great amount of debility has followed the majority of the cases.

Strength for September: Officers, 42; enlisted men, 1,215. Admissions, 328, divided as follows:

Diarrhea.....	36
Acute dysentery.....	7
Malarial fever.....	100
"Fever"	123
Typhoid fever.....	1
All other causes.....	61

Of the intestinal disorders, 31 cases were treated by the surgeon and returned to duty as follows: Within two days, 27; four to six days, 4. Of the 10 cases sent to hospital, 8 were furloughed as malaria after being under treatment one to seven days and 2 changed to typhoid fever.

Eighty-three cases diagnosed as malarial fever were treated by the surgeon and returned to duty as follows: After one day, 45; two to three days, 17; four to six days, 11; seven to nine days, 5; ten to thirteen days, 4; twenty-two days, 1.

Seventeen cases diagnosed as malarial fever were sent to hospital with the following result:

Changed to—	
Simple continued fever	1
Muscular rheumatism.....	1
Remittent fever	1
Malaria.....	3
Asthenia.....	1
Typhoid suspects	3
Febricula	1
Typhoid fever.....	1
Not traced	5

Typhoid suspects transferred to other hospitals could not be traced.

Two cases of "fever" were treated by the surgeon and lasted thirty days each.

One hundred and twenty-one cases of "fever" were sent to hospital with the following result:

Furloughed as—	
Malaria.....	11
Continued fever	4
Typhoid suspect.....	1
Febricula	1
Total	17

Changed to diagnosis of—	
Acute gastritis.....	1
Malaria.....	11
Lumbago	3
Remittent fever	6
Rheumatism	3
Febricula	2
Continued fever	6
Diarrhea.....	1
Bronchitis	1
Typhoid fever.....	42
Not diagnosed.....	1
Not recorded	27

Total

Grand total

The changes of diagnosis were nearly all made in Pennsylvania State hospitals, to which the patients were transferred. As numerous men were being furloughed at this time, the cases of which no record can be found were probably furloughed for various or no causes.

In addition to the 46 cases of typhoid fever already mentioned, 37 cases of this disease were found admitted to various State hospitals for September of which no mention is made by the regimental surgeon. Thus we are able to trace 83 cases of this disease in the First Rhode Island Volunteer Infantry for the month of September, as shown by the following table:

Date.	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
September 1..	1									1				2
2..	1		1	1	2				1	1				8
3..		1			1	1				1				5
4..					1	2	1				1			5
5..		1				2						1		4
6..			1	1	4	10				2	2	1		19
7..						2	1	1		2	2			8
8..						2								2
9..						1			1					2
11..				1					1					2
15..		1						3						4
17..	1										1			2
18..	1										1			2
19..		1		1							1	1		4
20..												1		1
22..								2		1				3
23..							1							1
24..					1						1			2
25..											1			1
26..							1							1
27..			1											1
28..	1					1						1		3
30..												1		1
Total	5	4	3	4	8	22	5	9	1	6	7	6	3	83

The regiment continued to occupy its same camp site during October. Strength: Officers, 41; enlisted men, 1,214. Admissions, 219, as follows:

Diarrhea	5
Dysentery	3
Malarial fever	44
"Fever"	94
Typhoid fever	3
All other causes	70

The intestinal disorders were treated by the surgeon and were of short duration, except 1 case of dysentery, lasting seventeen days.

All malarial fevers were treated by the surgeon and returned to duty as follows: After one day, 21; two days, 7; three to five days, 9; six to eight days, 4; ten days, 3.

The 94 cases diagnosed as "fever" were all sent to division hospital. Of these no record could be found in 26 cases. Of the 68 remaining cases—

There were furloughed as—	
Chronic diarrhea	1
Enteritis	1
Continued fever	9
Malaria	4
Total	15
There were transferred to State hospitals as—	
Malaria	10
Continued fever	3
Intermittent fever	1
Remittent fever	1
Typhoid fever	38
Total	53
Grand total	68

Of the cases transferred as typhoid fever to other hospitals, the diagnosis was confirmed in 31 cases, of

which 3 died. The remaining 7 cases reported as transferred to other hospitals could not be found.

The 3 cases of typhoid fever reported by the surgeon are included in the 31 cases mentioned above. As the 38 cases transferred to other hospitals from division hospital were sent within two to five days of admission, the diagnosis was purely tentative and probably erroneous in a number of cases. Fifteen additional cases of typhoid fever were reported from other hospitals. The following table gives the cases by company and dates of occurrence:

Date.	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
October 2..											1			1
4..					1									1
6..											1			1
7..			1											1
8..	1	1			1					1				4
9..	1													1
10..		1												1
11..		1												1
12..									1		1			2
13..		1	1											2
14..						1								1
15..					1							1		2
16..							1						1	2
19..	1								1					2
20..		1												1
21..					1	1								2
22..				1	1									2
23..			1				1							2
24..							3			1	1			5
26..	1						1							2
27..			1										1	2
28..				1										2
29..						1	1							1
30..	1								1					2
31..				1		1				1				3
Total	5	5	4	3	5	4	7	0	3	3	4	1	2	46

Strength for November: Officers, 43; enlisted men, 1,218. Admissions, 167, as follows:

Diarrhea	11
Dysentery	2
Malarial fever	15
"Fever"	42
Typhoid fever	0
All other causes	97

The malarial fevers were returned to duty within three days.

The 42 cases diagnosed as "fever" were transferred to division hospital. In 11 cases no record could be found. Of the 31 remaining cases—

There were furloughed as malaria		5
Transferred to State hospitals as—		
Continued fever	4	
Malaria	10	
Typhoid	8	
Typhoid suspects	4	
Total	26	
Grand total	31	

This regiment left Camp Meade, Pa., November 13, and was transferred by rail to Columbia, S. C. It had occupied its same camp site at Camp Meade from August 23 to November 13, a period of eighty-one days.

All cases mentioned above for November, except 3 malarial fevers, 1 "fever," and 9 diarrheal cases, were admitted between the 1st and the 12th of that month.

By strict sanitary precautions typhoid fever was practically stamped out at Camp Meade, Pa.

No case of typhoid fever occurred during December.

SUMMARY.

Mustered into service between May 8 and 15 at Quonset Point, Rhode Island.

Arrived at Camp Alger, Va., May 28, 1898.

Had no typhoid fever in State camp.

Did not import typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, July 12, 1898.

Typhoid fever in the First Rhode Island Volunteer Infantry, by months.

	July.	August.	Sep-tember.	Octo-ber.	Novem-ber.	Total.
Recognized cases.....	29	51	83	46	8	217
Probable cases.....	3	24	11	10	4	52
Total.....	32	75	94	56	12	269

Total cases of recognized typhoid fever..... 217

Total cases of probable typhoid fever..... 52

Total cases of recognized and probable typhoid fever..... 269

Number of deaths from recognized typhoid fever..... 10

Per cent of mortality among recognized cases of typhoid fever..... 4.61

Per cent of mortality among recognized and probable cases of typhoid fever..... 3.71

Left Camp Alger en route to Thoroughfare Gap, Va., August 3, 1898.

Arrived at Camp Meade, Pa., August 23, 1898.

Left Camp Meade, Pa., November 13, and was transferred to Columbia, S. C.

SECOND TENNESSEE VOLUNTEER INFANTRY.

Third Brigade, Second Division, Second Army Corps.

[Abstract of surgeon's statement—Capt. D. M. Hall, U. S. Volunteers.]

The regiment was mustered into service at Nashville, Tenn., May 24, 1898, and remained in camp about one week. Drinking water was obtained during this time from the general city supply. Excreta were deposited in pits and were covered with earth two or three times daily. No typhoid fever occurred in this camp.

The regiment arrived at Camp Alger, Va., May 29 and was placed in camp near the Thirty-third Michigan and the Seventh Illinois Volunteer Infantry. The camp site was a good one and had not been previously occupied by any command.

The regiment remained in this first camp two or three weeks, during which time spring water was used. It then moved its camp site about 400 yards and soon had a deep well finished. Spring water was also used and water from the "Campbell" well. Sinks for excreta were located about 60 yards from mess tents, the contents being covered three times daily. There were several shacks in the immediate vicinity of the camp, from which all manner of drinks and eatables were obtained. The surgeon could not state how soon

typhoid fever appeared in the regiment at Camp Alger, but no case occurred up to June 18, when he was detached from the regiment for duty at the division hospital.

REMARKS BY THE BOARD.

Examination of the sick and wounded reports for the period May 25 to 31 shows that in an average strength of 47 officers and 947 enlisted men there were 42 admissions, as follows:

Intestinal disorders.....	20
Malarial intermittent.....	15
Typhoid fever.....	0
Other causes.....	7

The surgeon remarks on this month's report:

The health of the regiment, considering the lack of tentage, clothing, etc., has been remarkable. The prevailing sickness has been malarial in expression.

The cases of intestinal disease, as well as those of supposed malarial origin, were of short duration, no case lasting longer than two days.

Although no case of typhoid fever was reported for May, we find that a private of Company G was admitted to the division hospital May 29 and transferred to Fort Myer June 5, and there diagnosed as a case of typhoid fever. So that this regiment imported 1 case of this disease into its Virginia camp.

The regiment changed its camp site during the first part of June, removing only about 400 yards, to higher ground.

Summary for June: Strength, officers, 46; enlisted men, 1,037. Admissions, 42, as follows:

Chronic diarrhea.....	1
Dysentery.....	2
Intermittent fever.....	5
Remittent fever.....	1
Undetermined fever.....	2
Typhoid fever.....	0
All other causes.....	31

The regimental surgeon states that he was absent during the month, and that it would appear that only the severer cases were included in this report.

The case of chronic diarrhea admitted June 6 was returned to duty June 30.

The cases of dysentery lasted six and twenty days, respectively.

The cases diagnosed as intermittent and undetermined fever were treated in quarters and returned to duty as follows: One day, 2; eleven days, 2; sixteen days, 2; twenty-six days, 2.

The case of remittent fever was reported as transferred to hospital after six days' treatment and could not be traced.

We observe that a case of supposed intermittent fever admitted from Company E June 29, and returned to duty June 30, was readmitted on July 1 and transferred to Second Division Hospital, where the diagnosis was

changed to typhoid fever. There were possibly other cases of this disease among those cases reported as of undetermined diagnosis.

During the first month, therefore, of occupancy of its Virginia camp only 2 cases of typhoid fever were recognized in the Second Tennessee Infantry, 1 of these being an imported case.

The regiment continuing to occupy its same camp site, we find for July, in an average strength of 44 officers and 1,277 enlisted men, 65 admissions to sick report, as follows:

Intestinal disorders.....	0
"Undetermined"	45
Typhoid fever.....	9
Other causes	11

The surgeon remarks on this report that "the cases classed as undetermined were those sent to the hospital before a positive diagnosis could be made." He adds that "typhoid fever of a mild type appeared."

Although the surgeon does not report any intestinal disorders for July, we find 12 cases of this character admitted to the Second Division Hospital, classed as follows:

Acute diarrhea	9
Acute dysentery.....	2
Gastritis	1

None of these cases lasted longer than two days.

Contrary to the surgeon's statement that the cases diagnosed as "undetermined" were those sent to hospital, we find 9 cases with this diagnosis treated in quarters by the surgeon and returned to duty, as follows: After one day, 2; eleven days, 1; twenty-seven days, 1; twenty-nine days, 1; thirty days, 2; thirty-seven days, 1; fifty-three days, 1—sufficiently long to have enabled him to make a correct diagnosis in these cases.

Of the remaining 36 "undetermined" cases reported as transferred to the Second Division Hospital during July, we find only 9 admitted to this hospital, of which 2 were diagnosed malarial fever and returned to duty after nine and thirteen days; 2 continued fever, and to duty after seven and twenty-six days, respectively; 2 dysentery, and to duty after three months, and 3 diagnosed as typhoid fever. Of the remaining 27 cases, we find 8 cases reported by the surgeon as returned to duty, as follows: Four days, 2; eleven days, 1; twenty-six to twenty-eight days, 2; sixty-one days, 1; ninety days, 2. Ten cases are reported as furloughed at intervals varying from twenty-eight to ninety days and 9 cases as "still absent sick" on October 31.

Although it is not possible to arrive at any positive conclusion as to the real character of these cases, the fact that typhoid fever was beginning to appear in the regiment would warrant the assumption that some of these were cases of that disease.

Omitting all of these, we yet find a total of 12 cases of typhoid fever for July.

In addition we find in the Second Division Hospital 13 cases diagnosed as malarial or continued fever and which were not recorded by the surgeon. These were all of short duration, none lasting longer than four days.

The regiment abandoned its camp site at Camp Alger, Va., August 9 and began a march to Thoroughfare Gap, Va., via Bull Run and Bristow station, arriving at Camp Meade, Pa., August 25.

The surgeon states that typhoid fever cases were more frequent this month, and that all suspicious cases were at once sent to the Second Division Hospital and reported as "undetermined."

In an average strength for August of 45 officers and 1,271 enlisted men there were 86 admissions, as follows:

Intestinal disorders.....	4
Malarial intermittent	8
Undetermined	42
Typhoid fever.....	0
Other causes	32

In addition to the 4 cases of intestinal diseases reported by the surgeon, we find 4 other cases admitted to the division hospital at Bristow Station. Of these 8 cases, 3 went to duty at the end of three days; 1 to duty after three months; 1 was changed to the diagnosis of typhoid fever, and 3 were not traced.

Of the cases of malarial fever, 1 was returned to duty after one day; 2 were furloughed after eleven days, and 5 were sent to hospital. Of the latter, 2 were changed to the diagnosis of typhoid fever and 3 cases could not be further traced, except that they were reported by the surgeon as "still sick" on October 31, but no diagnosis given.

Of the 42 cases reported as "undetermined," 20 appear to have been treated by the surgeon and 22 transferred to the division hospital. Of the former, 2 went to duty after one and twenty-three days' treatment, respectively; 11 were furloughed after periods varying from one to twenty-seven days; 3 were reported as "still sick" October 31, and 4 cases to duty, but still "undetermined," after periods varying from fourteen to ninety-two days. Of the cases sent to hospital, the diagnosis was changed in 5 cases to remittent fever, the cases lasting from thirty-three to seventy-seven days; 1 changed to diarrhea, and to duty after twenty-four days; 2 to continued fever, and to duty after twenty-three and ninety days; 13 changed to typhoid fever, and 1 was not traced.

Besides the 16 cases above referred to, in which the diagnosis was changed to typhoid fever, 9 other cases of this disease were found in division or general hospitals during August, thus increasing the cases to 25 for this month, a number which certainly falls below the actual prevalence of the disease. (Vide chart.)

The regiment arrived at Camp Meade, Pa., August 25, and remained encamped at this point until November 10.

During September, in an average strength of 44 officers and 1,246 enlisted men, there were 144 admissions, as follows:

Diarrhea.....	1
Malarial fever.....	20
Undetermined.....	60
Typhoid fever.....	2
Other causes.....	61

The surgeon remarks that "the prevailing diseases for this month are mostly of malarial origin, caused by the turf in the company streets being worn off and exposing the soil to the direct action of the sun. The cases of typhoid fever were caused by the men drinking from the springs found near the camp."

The case of diarrhea was furloughed at the end of ten days.

Of the 20 cases of malarial fever, 2 were reported as furloughed and 18 transferred to division and general hospitals. Of the latter, 14 were changed to typhoid fever and could not be traced further than to ascertain that 2 of these cases were returned to duty during October, and 2 were "still sick" at the end of this month.

Of the cases of undetermined character, 27 appear to have remained under the surgeon's care and 33 sent to various hospitals. Of the former, the disposition was as follows: Eight cases to duty after periods varying from one to fifty-seven days, with no diagnosis; 2 changed to diagnosis of diarrhea, 1 being returned to duty after three days and 1 furloughed after forty-one days; 9 cases changed to remittent fever, of which 3 went to duty after thirty-five, forty-six, and fifty days; 2 furloughed after thirty-four and fifty-two days; 2 "still sick" October 31 and 2 "still sick" December 31; 4 cases to duty as "undetermined" after thirty-nine to forty-nine days' treatment; 1 furloughed as febricula and still sick December 1, and 3 cases not traced.

Of the 33 cases said to have been sent to hospitals, 16 were changed to typhoid fever; 4 changed to continued fever and furloughed after thirty-seven to fifty-eight days, and 13 cases could not be located in hospital.

So that, although we have been unable to account for many cases of fever occurring during September, we have succeeded in adding 30 cases of typhoid fever to the two cases diagnosed by the surgeon.

The result of our search has been to show that typhoid fever increased in this regiment during the month largely occupied in moving from Camp Alger, Va., to Camp Meade, Pa., and also during the first month of its occupancy of the latter camp, there being recorded 25 cases for August and 32 cases for September against 12 cases for July.

We believe that double the number of cases of typhoid fever would have been recorded for both August and September had it been possible to properly follow up furloughed and undetermined cases.

During the month of October, in an average strength of 43 officers and 1,189 enlisted men, there were 130 admissions, as follows:

Malarial fever.....	4
Undetermined.....	15
Typhoid fever.....	0
All other causes.....	111

Of the malarial fevers 2 were furloughed, of which 1 was returned to duty after thirty-seven days. Two cases were sent to hospital, and both changed to typhoid fever.

Five cases of undetermined character were treated by the surgeon, of which 1 was changed to diarrhea, furloughed, and returned to duty after thirty-two days; 1 to malarial fever and furloughed after thirty days; 1 to continued fever and furloughed after thirty days, and 2 furloughed without diagnosis after thirty-six and fifty-three days.

Ten cases of undetermined character were reported as sent to division hospital. Of these 3 were changed to typhoid fever and 7 could not be found in hospital. Of the latter the surgeon reports 3 as sent to duty after thirty-two, thirty-six, and forty-eight days; 1 furloughed after twenty-nine days, and 3 as still sick December 31.

In addition to the malarial cases reported by the surgeon there were admitted to the Second Division Hospital during October 16 cases, which were disposed of as follows: Two furloughed after two and six days as "malaria;" 3 furloughed as continued fever after one, three, and seventeen days; 2 to duty as continued fever after three and ten days; 2 transferred to State hospitals as continued fever after four and twenty-four days; 2 transferred as remittent fever to State hospitals after one and twenty-four days' treatment, and 5 diagnosed as typhoid fever.

We have been unable to trace the cases furloughed or sent to other hospitals.

Besides the 10 cases of recognized typhoid fever above referred to 1 other case of this disease was found in a State hospital, thus making a total of 11 cases for October.

During the first week in November 8 cases of this disease were admitted to the Second Division Hospital from the Second Tennessee Infantry. On the 10th of this month the regiment left Camp Meade for Columbia, S. C. No other cases of this disease are reported for November, but we find 3 cases of supposed intermittent fever admitted after arrival at Columbia reported as "still sick" December 31.

During December 2 cases of supposed intermittent of twenty-eight and thirty days' duration are also reported.

SUMMARY.

Mustered into service May 24, 1898, at Nashville, Tenn.
Arrived at Camp Alger, Va., May 29, 1898.
Had no case of typhoid fever at State encampment.

Imported one case of recognized typhoid fever into Virginia camp.

Date of first case of recognized typhoid fever after arrival at Camp Alger, June 29.

Typhoid fever in the Second Tennessee Volunteer Infantry by months.

	May.	June.	July.	August.	September.	October.	November.	Total.
Recognized cases.....	1	1	12	25	32	11	8	90
Probable cases.....		4	34	23	20	16	5	102
Total	1	5	46	48	52	27	13	192

Total cases of recognized typhoid fever..... 90

Total cases of probable typhoid fever..... 102

Total cases of recognized and probable typhoid fever.. 192

Number of deaths from recognized typhoid fever..... 8

Percent of mortality among recognized cases of typhoid fever. 8.88

Per cent of mortality among recognized and probable typhoid fever cases..... 4.16

Left Camp Alger, Va., August 9 en route to Thoroughfare Gap, Va.

Arrived at Camp Meade, Pa., August 25.

Left Camp Meade, Pa., November 10 for Columbia, S. C.

HOSPITAL CORPS, SECOND ARMY CORPS.

REMARKS BY THE BOARD.

For the month of June, 1898, the average strength of this organization was 303 enlisted men. The admissions to sick report were:

Acute diarrhea	1
Malaria.....	3
Typhoid fever.....	0
Total	4

These cases were under treatment less than three days.

Summary for July: Mean strength, 652. Admissions, 39, as follows:

Intestinal disorders.....	14
Malarial fever.....	17
Typhoid fever.....	8

The duration of the intestinal diseases was as follows: Duty within three days, 8; nine days, 1; seventeen to twenty days, 3; not given, 2.

Of 17 cases diagnosed as malarial fever 5 were returned to duty within forty-eight hours; three to five days, 6; still after ten to sixteen days but no duration given, 4; changed to the diagnosis of typhoid fever, 2.

We thus find during the first month of occurrence of typhoid fever at Camp Alger, Va., 10 recognized cases among the members of the nursing corps, with 4 other probable cases.

Summary for August: Mean strength, 625. Admissions to sick report, 41, as follows:

Intestinal disorders.....	4
Malarial fever.....	20
Continued fever.....	3
Typhoid fever.....	14

The intestinal disorders were sent to duty within five days.

The disposition of the supposed malarial fevers was as follows: To duty after three days, 3; four to seven days, 6; eleven days, 2; furloughed after eleven days, 2; changed to the diagnosis of typhoid fever, 2; sent to State hospitals and no further record obtainable, 5.

One case of continued fever was sent to duty after twenty-four hours, and 2 transferred to general hospitals could not be traced.

Thus for the month of August we find a total of 16 cases of typhoid fever, with probably 11 additional cases of this disease.

Summary for September: Mean strength, 512; admissions, 74, as follows:

Malarial fever, remittent.....	40
Continued fever.....	2
Febricula	4
Typhoid fever.....	28

The disposition of the malarial fevers was as follows: To duty within two to five days, 6; eight days, 1; twenty-four days, 1; sixty-one days, 1; furloughed after two to seventeen days' treatment in hospital, 24; transferred to State hospitals, 7. Of the latter the diagnosis was changed to typhoid fever in 3 cases, and of 4 cases there was no record.

For September, therefore, the recognized cases of typhoid fever numbered 31, which we feel confident falls much below the real number for this month.

Summary for October: Mean strength, 520; admissions, 78, divided as follows:

Intestinal disorders.....	5
Undetermined fever	1
Continued fever.....	10
Febricula	1
Remittent fever	38
Typhoid fever.....	23

The case of febricula went to duty at the end of one day.

The case diagnosed as undetermined fever was reported as transferred to a State hospital, but could not be traced.

Of the cases diagnosed as continued fever 7 were furloughed as such after five to twelve days' treatment; 2 went to duty after two to four days; and 1 case was sent to a State hospital, where the diagnosis was changed to typhoid fever.

Of the supposed cases of malarial fever 3 were returned to duty after two days; 1 after fifteen days; and 1 at the end of thirty days, 16 were furloughed after periods varying from two to nine days, and 17 were reported as transferred to State hospitals. Of the latter 4 were changed to the diagnosis of typhoid fever, and 13 could not be traced.

We thus find 28 cases of recognized typhoid fever among the members of the Hospital Corps for October. The probable cases can not be accurately estimated.

Summary for November: Mean strength, 569; admissions, 9, as follows:

Intestinal disorders.....	1
Malarial fever.....	5
Typhoid fever.....	3

The case of intestinal disorder was changed to the diagnosis of typhoid fever.

Of the 5 supposed cases of malarial disease 2 went to duty after two to six days' treatment, and 3 were reported as transferred to State hospitals, but no record could be found of these cases.

For November, therefore, there were 4 cases of typhoid fever, with 3 probable cases.

During December, in a mean strength of 524, there were only 3 cases of diarrhea, which went to duty within three days; no malarial affections, and only 1 case of recognized typhoid fever.

SUMMARY.

Typhoid fever in the Hospital Corps, by months.

	July.	August.	Sep- tember.	Octo- ber.	Novem- ber.	Decem- ber.	Total.
Recognized cases	10	16	31	28	4	1	90
Probable cases	4	11	(a)	(a)	3		18
Total.....	14	27	31	28	7	1	108

a Not estimated.

Total cases of recognized typhoid fever.....	90
Total cases of probable typhoid fever	18

Total cases of recognized and probable typhoid fever..	108
Number of deaths from recognized typhoid fever	8
Per cent of mortality among recognized typhoid-fever cases..	8.88
Per cent of mortality among recognized and probable cases of typhoid fever.....	7.40

GENERAL DISCUSSION OF TYPHOID FEVER IN THE SECOND DIVISION, SECOND ARMY CORPS.

In considering the origin and course of typhoid fever in the Second Division, we desire to call attention to the remarkable exemption from this disease which the several regiments of this division experienced in their State encampments. No case of typhoid fever appears to have actually occurred in any of these regiments prior to their arrival at Camp Alger, Va., and only two, namely, the Sixth Pennsylvania, encamped at Mount Gretna, Pa., and the Second Tennessee, encamped at Nashville, Tenn., imported each 1 case of typhoid fever into the Virginia camp.

In the case of the Sixth Pennsylvania, which arrived at Camp Alger, Va., on May 19, we find a case of typhoid fever admitted from Company K on May 29 and transferred to the general hospital at Fort Myer, Va., where the diagnosis was confirmed.

In the case of the Second Tennessee, which arrived on May 29, we find that a case of typhoid fever was admitted from Company G on the same date.

We deem it worth observing that six of the regiments of the Second Division were assembled at or near west-

ern cities and that only three were assembled near eastern or southern cities.

Of the latter, typhoid fever was imported into Camp Alger by two, namely, Sixth Pennsylvania and Second Tennessee Infantry.

We have already referred to the facts that the regimental camps of this division were less crowded for space than those of the First Division and that up to the period ending June 30 only 11 cases of typhoid fever occurred in the Second Division.

Taking the mean strength of this division for the month of June, namely, 11,257 men, we find a percentage of only 0.97 per 1,000 men. This must be considered as a remarkably low percentage of sickness from typhoid fever when we remember that this division had already been encamped at this station an average of thirty-four days, and this, too, during a period when the water supply was being obtained from various sources—brooks and springs—regarded by the regimental medical officers as of decidedly questionable character. No stronger evidence, however, could be brought against the theory of water contamination than the fact that for the period ending June 30 of the 113 company organizations constituting the Second Division only 10 companies had experienced one or more cases of typhoid fever, and these companies were a part of six different regimental organizations.

By referring to the occurrence of typhoid fever in the First Division as compared to the Second Division, it will be seen that the percentage per 1,000 men for the same period was 1.88, or nearly double that given for the Second Division; and if we continue the comparison during the period ending July 31, we find that the percentage of occurrence of typhoid fever in the Second Division at Camp Alger, Va., still remained less than that of the First Division, namely, 10.8 per 1,000 men as compared with 15.2 for the First Division. We observe, however, that the comparative rate of increase is practically the same for both divisions.

Foci of infection having by the end of June become internal to this division, we find, just as we did, in the First Division, a slow but steady increase in the number of cases of typhoid fever, which rises from 11 cases during the month of June to 135 cases for July, and we note further that all of the regiments have now become infected. In other words, the sources of infection being both internal and external to the camp, the chances for infection were much multiplied; hence we find by the 31st day of July the number of company organizations in which typhoid fever had occurred has increased from 10 to 59, leaving still 54 company organizations, distributed among all of the regiments of this division, which were as yet unaffected by the disease. These noninfected companies, it must not be forgotten, were obtaining their water from the general regimental supply.

We have already shown that during the month of

August, while the First Division still remained at Camp Alger, although occupying new camp sites, typhoid fever had continued to rapidly increase, reaching a percentage of 34.44 per 1,000 men. During the same month the Second Division, which had occupied, with a single exception, their original camp sites from May 19 to July 31, were placed under different conditions, inasmuch as these regiments took their departure from Camp Alger on August 3 (Ninth Ohio excepted) and began a march to Thoroughfare Gap, Va., via Bull Run and Bristow Station, Va. This march, which was begun during extremely hot weather, was terminated six days later, when the regiments went into camp at Thoroughfare Gap, where they remained for the period of about two weeks. At the end of this time the division was transported by rail to Camp Meade, Pa.

As this division was ordered from Camp Alger by reason of the prevalence of typhoid fever in its several regiments, it remains to be seen what good was attained in this respect from the march through Virginia to the encampment at Thoroughfare Gap. The following table will show the number of cases which occurred in each regiment of this division during July and August:

Regiment.	July.	August.
Twenty-second Kansas.....	4	22
Third New York.....	20	105
One hundred and fifty-ninth Indiana.....	16	45
Seventh Illinois.....	11	39
Sixth Pennsylvania.....	6	20
First Rhode Island.....	27	51
Ninth Ohio Battalion.....	2	6
Fourth Missouri.....	17	30
Second Tennessee.....	12	25
Third Missouri.....	16	46
Total.....	131	389

During the same time, in addition to the 389 cases of recognized typhoid fever, there were 146 cases of probable typhoid fever recorded as occurring among the regiments of the Second Division. Deducting 6 cases of recognized typhoid fever which occurred in the Ninth Ohio Battalion, and which organization did not accompany the Second Division on its march through Virginia, we find a balance of 383 cases of typhoid fever in a mean strength of 12,164 men, or a percentage of 31.48 per 1,000 men.

If we compare the number of cases of typhoid fever occurring in the regiments of this division during the first fifteen days of August, and which may be considered as infections prior to departure from Camp Alger, and those recorded for the last half of August, we obtain the following results:

Regiment.	August 1 to 15.	August 16 to 31.
Twenty-second Kansas.....	7	15
One hundred and fifty-ninth Indiana.....	24	21
Third New York.....	48	57
Sixth Pennsylvania.....	9	11
Seventh Illinois.....	15	24
Fourth Missouri.....	8	20
Third Missouri.....	21	26
First Rhode Island.....	20	31
Second Tennessee.....	13	12
Total.....	165	217

Since the cases, 217 in number, occurring during the latter half of August may be considered as infections acquired en route to Camp Meade, Pa., it will be plainly seen that this division not only failed to shake off typhoid fever, but even experienced an increase of this disease. We can now readily see that this was due to the fact that the division, after marching for six days, went into a more or less permanent camp at Thoroughfare Gap, Va., and as each regiment was already badly infected there was no reason why the disease should not continue to be propagated in increased numbers. Indeed, the very object for which this march was begun was effectually defeated by the stay of the division at Thoroughfare Gap for a period of from ten to fourteen days. We do not doubt that if, instead of camping at this place, it had been possible to continue the march until the middle of August, typhoid fever would have been to a large extent eradicated from the several regiments. From a sanitary point of view the transference of this division by rail from Thoroughfare Gap, Va., to Camp Meade, Pa., was a mistake, since each of the regiments carried their infection with them, and hence we are not surprised to find that many cases of typhoid fever still continued to occur after arrival at the latter camp.

The subsequent history of the course of typhoid fever in this division will be found in the individual histories of these regiments, as well as under the head of typhoid fever at Camp Meade, Pa.

It remains to discuss briefly the occurrence of typhoid fever among the men of the Hospital Corps companies at Camp Alger, Va., since the members of this corps came into more intimate contact with patients the subjects of typhoid fever than the men of the regimental organizations.

We have already seen that during the month of June there were only 1.42 cases of typhoid fever per 1,000 men in both divisions of the Second Corps. During the same period no cases of typhoid fever are recorded among the men of the Hospital Corps. We begin to appreciate during July, however, the danger involved in the personal handling and nursing of typhoid-fever cases, especially by nurses who were ignorant of the danger of infection; for while the percentage of cases per 1,000 men for the two divisions reaches only 4.06, there were 15.3 cases per 1,000 men among the members of the Hospital Corps. These percentages rise to 25.6 per 1,000 for August, 60.54 for September, 53.84 for October; and even during November, when but few cases of typhoid fever were occurring in the Second Army Corps, not less than 7 per 1,000 of the men of the Hospital Corps were still sick with typhoid fever. During this period there were 89 cases of recognized typhoid fever and 18 probable cases in a mean strength of 575 men. We have been able to record 8 deaths among the recognized cases—a mortality of 8.88 per cent.

Since the Hospital Corps was divided into three companies of about 200 men each and placed under the best sanitary surroundings, nothing could point more strongly to the danger of personal contact with those sick with typhoid fever than the foregoing percentages of morbidity. Failure to carry out careful disinfection of excreta and neglect of hand disinfection after contact with cases of the disease were unquestionably the important factors in the propagation of the infection.

In striking contrast to the high percentage of cases of typhoid fever in the Hospital Corps may be mentioned the course of the disease among the 200 men constituting the signal corps company, with a record of only 6 cases of typhoid fever for the period May 30 to December 31, 1898.

TYPHOID FEVER IN THE THIRD DIVISION, SECOND ARMY CORPS.

NINTH MASSACHUSETTS VOLUNTEER INFANTRY.

Separate Brigade, Third Division, Second Army Corps.

[Maj. Francis Magurn, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

The regiment was mustered into service at South Framingham, Mass., May 9 to 12, 1898, and remained during the rest of the month at its State encampment. There were only 4 admissions in a strength of 47 officers and 896 enlisted men. No intestinal disorders nor typhoid fever were reported.

The command arrived at Camp Alger, Va., June 1, and left June 24 for service in Cuba.

No regimental reports after May 31 are accessible for study; but from the records of the provisional division hospital of the Fifth Corps in Cuba we find that between July 17 and August 24 there were admitted from this regiment 498 patients, as follows:

Typhoid fever.....	62
Malarial disease.....	434
Intestinal disorders.....	2

Of the 434 malarial cases, 32 were transferred to hospital ships and general hospitals, and could not be further traced. The remaining 402 cases were returned to duty in from one to fifteen days, 70 per cent of these cases being returned to duty within five days.

In addition to the 62 cases of typhoid fever reported from the hospital above referred to, we have also found 13 cases under treatment in the general hospital at Camp Wyckoff, N. Y., and 3 cases admitted to the Josiah Simpson Hospital, Old Point Comfort, Va. Up to the time of the departure of the Ninth Massachusetts Volunteer Infantry from Camp Alger no case of typhoid fever had occurred. This regiment, therefore, probably acquired the disease after its arrival on the island of Cuba.

Since it has been impossible to obtain the dates of commencement of sickness in the cases admitted to the

provisional division hospital, we have not attempted to chart the fevers in this regiment.

Among the recruits belonging to this organization left behind at Camp Alger we have been able to trace 31 cases of typhoid fever, namely, July, 3; August, 25; September, 3.

The first case was admitted from Company D to division hospital, with diagnosis of continued fever on July 26, and transferred to the general hospital at Fort Myer, where the diagnosis of typhoid fever was established.

The recruits of this regiment forming a part of the separate brigade, Third Division, marched with the Second Division of the Second Corps from Camp Alger to Thoroughfare Gap, Va.

Of the cases occurring among the recruits of this regiment, forming a part of the separate brigade, Third Division, which left Camp Alger August 3, we note that only 4 cases are recorded for the first half of August, whereas 21 cases were admitted during the period August 18 to 30, thus showing that these men became infected while on the march to Thoroughfare Gap, Va.

SUMMARY.

Mustered into service at South Framingham, Mass., May 9 to 12, 1898.

Arrived at Camp Alger, Va., June 1, 1898.

Did not import typhoid fever into Virginia camp.

Had no typhoid fever at State encampment.

Had no typhoid fever at Camp Alger before leaving for Cuba.

Left Camp Alger for Cuba June 24, 1898.

Number of cases of recognized typhoid fever between July 17 and August 24, 1898, as per hospital records of Provisional Division, Fifth Corps, Cuba.....	62
Number of cases of recognized typhoid fever found under treatment at Camp Wyckoff General Hospital.....	13
Number of cases of recognized typhoid fever found under treatment at Josiah Simpson General Hospital.....	3

Total cases of recognized typhoid fever found at division and general hospitals..... 78

Recruits belonging to this regiment who arrived after regiment's departure for Cuba, were assigned to Separate Brigade, Third Division, Second Army Corps.

Date of first case of recognized typhoid fever among recruits after arrival at Camp Alger, July 26, 1898.

Number of cases of recognized typhoid fever among recruits left behind at Camp Alger, for July.....	3
Number of cases of recognized typhoid fever among recruits left behind at Camp Alger, for August.....	25
Number of cases of recognized typhoid fever among recruits left behind at Camp Alger, for September.....	3

Total cases of recognized typhoid fever among recruits left behind at Camp Alger..... 31

Recruits left at Camp Alger August 3, 1898, en route to Thoroughfare Gap, Va.

Total cases of recognized typhoid fever for the regiment, so far as ascertained..... 109

Probable cases not estimated.

Deaths from recognized typhoid fever.....	34
Per cent of mortality among recognized cases of typhoid fever.....	31.19

THIRTY-THIRD MICHIGAN VOLUNTEER INFANTRY.

Separate Brigade, Third Division, Second Army Corps.

[Maj. Victor C. Vaughan, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This command was mustered in at Island Lake, Mich., where it remained until May 28, 1898.

The regiment, consisting of 47 officers and 978 enlisted men, arrived at Camp Alger, Va., May 31, 1898. The health of the men appears to have been good up to this time and to have continued so until June 23, on which date the regiment left Camp Alger for service in Cuba.

Owing to the entire absence of monthly reports of sick and wounded^a no attempt has been made to follow the course of either malarial diseases or typhoid fever.

From the records of the general hospital at Camp Wikoff, N. Y., to which point the regiment was transferred during the month of August, we note the admission of 9 cases of typhoid fever and 95 cases of intermittent and remittent fever from the Thirty-third Michigan Volunteer Infantry. So that typhoid fever appears to have developed to some extent in this command during its service in Cuba.

Recruits belonging to this organization who arrived after the regiment's departure for Cuba were assigned to the Provisional Brigade of the Third Division, Second Army Corps. Among these men 4 cases of typhoid fever developed during July, 22 in August, and 6 in September, as shown by the records of the Second Division Hospital and the general hospital at Fort Myer. The earliest cases developed during the last week in July. In tracing these cases we have found a large number of cases which had been diagnosed as malarial fever afterwards changed to typhoid fever.

These recruits left Camp Alger August 3 and marched to Thoroughfare Gap, Va., with the regiments constituting the Second Division of the Second Army Corps.

No chart has been prepared for this regiment.

SUMMARY.

Mustered in at Island Lake, Mich., where it remained until May 28, 1898.

Arrived at Camp Alger, Va., May 31, 1898.

Had no typhoid fever at State encampment.

Did not import typhoid fever into Virginia camp.

Left Camp Alger June 23, 1898, for service in Cuba.

Regiment transferred from Cuba during August to Camp Wyckoff, N. Y.

Number of cases of recognized typhoid fever admitted to general hospital at Camp Wyckoff, N. Y. 9

Recruits belonging to this organization who arrived after the regiment's departure for Cuba were assigned to a provisional brigade of the Third Division, Second Army Corps.

^a The regimental surgeon was relieved from duty with the regiment and assigned to other duty at the beginning of July.

The earliest cases of typhoid fever among the recruits developed during the last week in July.

Number of cases of recognized typhoid fever among recruits for July	4
Number of cases of recognized typhoid fever among recruits for August	22
Number of cases of recognized typhoid fever among recruits for September	6

Total cases of typhoid fever among recruits..... 32

Recruits left Camp Alger, Va., August 3 en route to Thoroughfare Gap, Va.

Total cases of recognized typhoid fever for the regiment, so far as ascertained..... 41

Probable cases not estimated.

Deaths from recognized typhoid fever 14

Per cent of mortality among recognized cases of typhoid fever 34.17

THIRTY-FOURTH MICHIGAN VOLUNTEER INFANTRY.

Separate Brigade, Third Division, Second Army Corps.

[Maj. J. A. King, surgeon, U. S. Volunteers.]

REMARKS BY THE BOARD.

This regiment was assembled at Island Lake, Mich., during the month of May, and remained at that point until June 8, 1898. In a strength of 39 officers and 938 enlisted men there were reported 31 admissions to sick report for the month. Intestinal disorders contributed 13 cases, all of brief duration. No malarial or typhoid fever was reported.

The regiment reached Camp Alger, Va., June 9, and left that point for service in Cuba June 24. No report for the month of June is accessible.

The regiment disembarked in Cuba on July 1 and remained there until after the middle of August, when it was transferred to Montauk Point, N. Y. The surgeon states that malarial fevers, dysentery, and diarrhea early appeared after arrival in Cuba. He complains of the difficulty in obtaining the necessary record blanks, and reports 294 admissions to sick report from July 18 to 31, divided as follows:

Remittent malarial fever.....	246
Dysentery and diarrhea.....	34
All others.....	14

No strength is given, and the foregoing figures probably do not cover the sickness of the whole regiment.

For the month of August 458 malarial fevers, remittent and intermittent, and 85 cases of dysentery and diarrhea are reported. We observe that no case of typhoid fever was reported on the regimental returns among the 871 admissions during July and August. We note, however, the admission of 7 cases of typhoid fever from this regiment to the division hospital, Provisional Division, Fifth Army Corps. These cases probably occurred among the men who had been detached from the command during the campaign in the Santiago hills. The first case was admitted August 4, and died August 5.

The other 6 cases were admitted between this date and August 19. Following the regiment to Montauk, we have 4 additional cases of typhoid fever in the general hospital at Camp Wyckoff. Four other cases were admitted from this regiment and sent to St. Francis Hospital, New York, thus making a total of 15 cases from the command while serving in Cuba.

Among the recruits belonging to this regiment left at Camp Alger, Va., we have been able to trace 29 cases of typhoid fever. The first case, admitted from Company M on June 16 and transferred to Second Division Hospital with the diagnosis of "continued high temperature," was returned to quarters June 30, readmitted July 1, and transferred to Fort Myer, Va., August 6, where the diagnosis of typhoid fever was confirmed; so that this case really belongs to the regimental cases of the Thirty-fourth Michigan Volunteer Infantry and shows that this regiment imported at least 1 case of typhoid fever into its Virginia camp.

The first case to appear among the recruits left at Camp Alger was admitted July 26, followed by a second case July 31. During the march through Virginia with the Second Division of the Second Army Corps 24 other cases developed, and during September 2 cases.

No chart has been prepared for this regiment.

SUMMARY.

Mustered into service during May, 1898, at Island Lake, Mich.	
Arrived at Camp Alger, Va., June 9, 1898.	
Had no case of typhoid fever at State encampment.	
Imported 1 case of typhoid fever into Virginia camp.	
Left Camp Alger June 24, 1898.	
Disembarked in Cuba July 1, 1898.	
Transferred from Cuba to Montauk Point, N. Y., after middle of August.	
First case of recognized typhoid fever after arrival in Cuba, August 4.	
Number of cases of recognized typhoid fever under treatment at provisional division hospital, Fifth Army Corps, Cuba, during July and August	7
Number of cases of recognized typhoid fever under treatment at Camp Wyckoff General Hospital, N. Y.	4
Number of cases of recognized typhoid fever under treatment at St. Francis Hospital, N. Y.	4
Total cases of recognized typhoid fever found in division, general, and city hospitals	15

Recruits belonging to this organization arriving after regiment left for Cuba were assigned to the Separate Brigade of the Third Division, Second Army Corps.

Date of first case of recognized typhoid fever among recruits after arrival at Camp Alger, Va., July 26, 1898.

Number of cases of recognized typhoid fever among recruits for July	3
Number of cases of recognized typhoid fever among recruits for August	24
Number of cases of recognized typhoid fever among recruits for September	2

Total cases of recognized typhoid fever among recruits. 29

The recruits left Camp Alger in August with Second Division, Second Army Corps, en route to Thoroughfare Gap, Va.

Total cases of recognized typhoid fever for the regiment, so far as ascertained

Probable cases not estimated.

Number of deaths from recognized typhoid fever

Per cent of mortality among recognized cases of typhoid fever

REMARKS CONCERNING TYPHOID FEVER IN THE SEPARATE BRIGADE, THIRD DIVISION, SECOND ARMY CORPS.

It will be seen that only one of the three regiments constituting this brigade, namely, the Thirty-fourth Michigan Volunteer Infantry, imported a case of typhoid fever into the Virginia camp. No cases of this disease had occurred at the State encampment. As the regiments constituting this brigade left Camp Alger, Va., on June 23 and 24, sufficient time had not elapsed between their arrival and departure to allow the development of typhoid fever in their camps.

It has been impossible to obtain any data of value concerning the origin and course of typhoid fever among these regiments after their arrival on the island of Cuba.

A certain number of recruits for each of these regiments arrived at Camp Alger after their departure for Cuba. Typhoid fever appears to have developed among the recruits left behind from each regiment. As with the regiments of the First and Second Divisions, the disease began among these recruits during the latter part of July and decidedly increased during August while accompanying the Second Division on its march through Virginia.

Table showing, for the regiments of the Second Army Corps assembled at Camp Alger, the mortality and morbidity from typhoid fever.

Regiments.	Mean strength.	Cases of typhoid fever.		Deaths from typhoid fever.	Deaths from all diseases.	Deaths from typhoid fever in 100 cases of—		Percent age of deaths from typhoid to deaths from all diseases.	Morbidity of typhoid fever in 1,000 mean strength—		Deaths from typhoid fever in 1,000 of mean strength.
		Certain.	Certain and probable.			Certain typhoid.	Certain and probable typhoid.		For certain cases of typhoid.	For certain and probable cases of typhoid.	
First Division, Second Army Corps.											
Sixty-fifth New York.....	1,221	212	219	14	18	6.60	6.39	77.77	173.62	179.36	11.46
Seventh Ohio.....	1,169	123	125	4	5	3.25	3.20	80.00	105.21	106.93	3.42
First New Jersey.....	1,275	35	58	8	10	22.85	13.79	80.00	27.44	45.49	6.27
Eighth Pennsylvania.....	1,044	91	101	8	9	8.79	7.92	88.88	87.16	96.74	7.66
Twelfth Pennsylvania.....	837	107	123	23	24	21.49	18.69	95.83	127.83	146.95	27.47
Thirteenth Pennsylvania.....	821	97	105	15	19	15.46	14.28	78.94	117.72	127.42	18.20
Third Virginia.....	1,141	43	70	13	14	30.23	18.57	92.85	37.68	61.34	11.39
First Connecticut.....	1,085	135	142	19	20	14.07	13.38	95.00	124.41	130.87	17.51
Total.....	8,596	843	943	104	119	12.33	11.02	87.39	98.06	109.70	12.09
Second Division, Second Army Corps.											
Twenty-second Kansas.....	1,199	52	83	11	15	21.15	13.25	73.33	43.37	69.22	9.17
One hundred and fifty-ninth Indiana.....	1,190	80	89	8	11	10.00	8.98	72.72	67.22	74.78	6.72
Third New York.....	1,211	155	185	31	35	20.00	16.75	88.57	127.99	152.76	25.59
Seventh Illinois.....	1,219	72	119	2	2	2.77	1.68	100.00	59.06	97.62	1.66
Sixth Pennsylvania.....	1,236	35	36	6	9	17.14	16.66	66.66	28.31	29.12	4.83
Fourth Missouri.....	1,196	127	156	18	24	14.17	11.53	75.00	106.18	130.43	15.05
Ninth Ohio Battalion.....	384	39	54	5	5	12.82	9.25	100.00	101.56	140.62	13.02
Third Missouri.....	1,165	97	100	9	13	9.27	9.00	69.23	83.26	85.83	7.72
First Rhode Island.....	1,209	217	269	10	11	4.60	3.71	90.91	179.48	232.49	8.27
Second Tennessee.....	1,202	90	192	8	15	8.88	4.16	53.33	74.85	159.65	6.65
Total.....	11,211	964	1,283	108	140	11.20	8.41	77.14	85.98	114.44	9.63
Total Second Army Corps.....	19,807	1,807	2,226	212	259	11.73	9.52	81.87	91.23	112.38	10.70
Sixth Illinois.....			75	8	12	Sent to Cuba and Porto Rico after a short stay at Camp Alger.					
Sixth Massachusetts.....			196	18	18						
Eighth Ohio.....			23	9	64						
New York Cavalry, A and C.....			12	1	2						
Ninth Massachusetts.....			109	34	85						
Thirty-third Michigan.....			41	11	33						
Thirty-fourth Michigan.....			44	26	48						
Total.....			2,726	322							

MALARIAL DISEASES IN THE SECOND ARMY CORPS AT CAMP ALGER, VA.

A comparison of the individual histories of the several regiments constituting the Second Army Corps will show that in the large majority of these regiments the diagnosis of malarial disease, either as intermittent, remittent, or simply as malaria, has been given to most of the cases of fever admitted to sick report. Indeed, next to intestinal disorders malarial cases have contributed the largest number to the sick list, the relative figures being 243.5 cases per 1,000 for intestinal disorders and 185.6 cases per 1,000 for malarial diseases.

As the region round about Camp Alger, Va., including the city of Washington and the district of country lying along the Potomac River, has been during certain years well known for the prevalence of malarial diseases, especially during the months of July, August, and September, it becomes necessary to look closely into the matter of the occurrence of malarial affections among the troops encamped at Camp Alger, Va., during the summer of 1898.

If the monthly regimental reports are examined attentively and the duration of the supposed malarial diseases accurately determined, it will be found that many of these supposed malarial affections lasted less than twenty-four hours and that not less than 33 per cent were returned to duty at the expiration of two days.

Another important fact bearing upon the nature of these cases is that in June, when the occurrence of malarial diseases is extremely rare in the vicinity of Washington, this disease had already made considerable progress in the majority of the regiments stationed at Camp Alger, Va., if the diagnosis of the regimental medical officers is to be accepted as correct.

Since, however, blood examinations were not made in order to substantiate the diagnosis of malarial diseases, we do not hesitate to state that, in our opinion, these mild fevers were not, as a rule, of malarial character. We believe that many of them, perhaps the majority, were due to intestinal disturbances, brought on through indiscretion in diet and by the new conditions to which the young soldier was subjected.

Concerning the cases of supposed malarial diseases of longer duration, we have already repeatedly pointed out, in the histories of individual regiments, the large number of cases which, upon transfer to division or general hospitals, have been changed in diagnosis to typhoid fever, and we have indicated our belief that many cases which did not last more than ten days, or which were furloughed prior to the time when a diagnosis could be made, were probable cases of that disease.

We will have occasion to point out hereafter that the men who were subject to these supposed malarial attacks

had acquired a considerable immunity to subsequent attacks of typhoid fever, as compared with those men who did not experience such supposed malarial attacks.

For the purpose of more definitely clearing up the character of these cases, this board requested of the Surgeon-General that a competent observer should be sent to Camp Alger, Va., for the purpose of making

blood examinations of cases of fever at that encampment. In response to this request, Acting Asst. Surg. James Carroll, U. S. Army, visited Camp Alger, Va., on August 24, 26, and 29. The subjoined table gives the results of the microscopic examination of the blood, together with the application of Widal's test:

To determine the general types of fever at Camp Alger, Va.

Observation.	Company.	Regiment.	History.	Examination for malarial parasites.	Widal.
1. W. A. G.	E	Twelfth Pennsylvania	Chilly sensations, followed by fever. Believed to be convalescing from mild attack of malarial fever. Admitted to sick report day after blood examination.	Negative	Positive.
2. H. C. R.	E	do	A number of frank chills, followed by fever and sweating. Believed to be convalescing from mild attack of malarial fever. Admitted to sick report day after blood examination.	do	Do.
3. H. W. S.	E	do	Chilly sensations, followed by slight malaise. Not on sick report.	do	Negative.
4. J. H.	E	First New Jersey	Chilly sensations last night. Has had similar sensations regularly every night for five days, followed always by fever. Is taking quinine, gr. 2 every 4 hours. Diagnosis, malarial fever.	do	Positive.
5. J. C. R.	E	Seventh Ohio	Sick about one week. No distinct chills, but cold and warm sensations. Cold in the morning and warm during rest of the day and at night. Taking quinine. Diagnosis, malarial fever.	do	Partial reaction.
6. F. L.	E	Third Missouri	Sick four days in hospital. Has had diarrhea continuously. Temperature remittent for the last two days, and has now dropped to subnormal. No previous record of temperature. Taking quinine. Diagnosis, malarial fever.	do	Positive.
7. Wm. D.	C	Thirteenth Pennsylvania ..	Several evenings frank chills, followed by fever and sweating. Temperature normal this a. m.—is now (11 a. m.) 103°. Diagnosis, malarial fever.	do	Partial reaction.
8. J. A. ....	.....	Hospital Corps	Is semidelirious with subsultus, etc. Roseola. Diagnosis, typhoid fever.	.....	Positive.
9. E. W.	I	Third New York	In third week. Roseola. Diagnosis, typhoid fever .....	.....	Do.
10. J. S.	B	Twelfth Pennsylvania	do .....	.....	Do.
11. F. J. H.	B	First New Jersey	Early stage. In hospital three days. Roseola. Diagnosis, Typhoid fever.	.....	Do.
12. S. J.	G	Third Virginia	Convalescent. Diagnosis, typhoid fever .....	.....	Do.
13. J. F. C.	B	Sixty-fifth New York	do .....	.....	Do.
14. W. C. W.	E	Third Virginia	Convalescent. Fourth week. Diagnosis, typhoid fever .....	.....	Do.
15. F. H. S.	B	Seventh Ohio	Severe case. Diagnosis, typhoid fever .....	.....	Do.
16. W. W.	B	do	do .....	.....	Do.
17. Wm. W.	Band ..	Sixty-fifth New York	Between third and fourth week. Temperature has just reached normal. Diagnosis, typhoid fever.	.....	Do.
18. Wm. F. F. ....	.....	Hospital Corps	This man has been nursing cases of typhoid fever. He is just taken sick. Temperature 101°. Has coated tongue with bright red tip and margin. Malaise.	Negative	Negative.
19. J. K.	A	First New Jersey	Sick five days. Has had repeated chilly sensations and fever. Temperature 99.2° this morning and is rising now. Diagnosis, remittent fever.	do	Positive.
20. C. K.	C	Thirteenth Pennsylvania ..	Chilly sensations and fever, with sweating, about two weeks ago. Has also suffered from insomnia and restlessness. On sick report one week. Regarded as a doubtful case. Has typical typhoid tongue. One rose spot on abdomen. Diagnosis on admission, ephemeral fever.	do	Do.
21. S. E. H.	A	Seventh Ohio	Cold sensations followed by fever and sweating; chills repeated several times a day for several days. Has been sick ten days. Has a little temperature now—was 101.2° this morning. Diagnosis, malaria.	do	Do.
22. J. R.	G	do	Has been sick two weeks. Began with fever. Never had a chill. His tongue is coated and the edges are bright red. Diagnosis, malarial intermittent.	do	Do.
23. M. McD.	I	First New Jersey	Sick about one week. Temperature, normal; is convalescent. Diagnosis, remittent fever.	do	Motility impaired, and there is a slight agglutination. Control used.
24. C. B.	A	Seventh Ohio	Says he had a typical shake four days ago, followed by fever and sweating. Had a light chill on the following evening, but none since. Has been sick in all about eight days and is convalescing. Does not look badly, but says he feels very weak. Dr. Palmer reports that he found crescents and ring forms in this man's blood two days ago.	do	Negative.

The result of the blood examination in the foregoing cases, selected at random, points plainly to the typhoid character of the majority of those cases considered to be of malarial origin.

We have also traced the cases of supposed remittent and intermittent fever which were transferred from the division hospitals at Camp Alger, Va., to the general hospital at Fort Myer, Va. Through the courtesy of Acting Asst. Surg. J. J. Curry, pathologist of the latter hospital, to whom this board is much indebted for valuable assistance, we have been able to follow 92 cases of supposed remittent fever admitted from 20 regimental organizations of the Second Army Corps.

In 31 cases the disease was found to be of an entirely different nature, the diagnosis being changed to rheumatism, febricula, debility, heat prostration, pleurisy, pneumonia, acute bronchitis, acute diarrhea, and acute conjunctivitis.

Of the remaining 61 cases of supposed remittent fever, the diagnosis was changed in 1 case to tertian intermittent fever, and in 60, or 98.3 per cent, to typhoid fever.

We are further informed by Doctor Curry that during his service at the general hospital at Fort Myer, Va., where he was daily conducting blood examinations from June until September, he did not find the malarial

parasite in any other case of supposed malarial disease transferred from Camp Alger.

If further testimony were needed to show that malarial diseases were extremely rare among the troops of the Second Army Corps stationed at Camp Alger, Va., we would point to the instance of the First Connecticut Infantry, which left that camp on September 7, 1898, and shortly thereafter transferred to hospitals at Hartford and New Britain, Conn., 101 cases of fever. Of these, we have been informed by the medical superintendents of the hospitals located at the above-mentioned cities that 98 received the diagnosis of typhoid fever and only 3 the diagnosis of malaria. We have been further informed that in the latter cases the diagnosis of malaria was based solely on the temperature curve, and not upon blood examinations.

As this regiment left Camp Alger, Va., at a time when malarial diseases should have been particularly rife, and as its regimental camp site and the conditions under which its men were placed were not exceptional, the irrefutable evidence above given as to the character of its fevers will show that, notwithstanding the opinions of the regimental medical officers, malarial fever did not exist, save to an unimportant extent, at Camp Alger, Va.

We have already expressed our belief that many of these short fevers were due to errors in diet and to the changed conditions surrounding the young soldier. We have also entertained the opinion that some of these fevers of shorter duration might be due to infection with the typhoid bacillus, and hence were to be considered as cases of mild or abortive typhoid fever.

The coincident rise and fall of these fevers with that of the occurrence of recognized typhoid fever in certain companies and regiments has led us to look more carefully into this subject. For this purpose we have with much labor followed all cases of fever, of whatever character, occurring in 19 regiments between June 1 and December 31, 1898, in order to ascertain how many of these men afterwards contracted typhoid fever.

We have also carefully followed for the same period all soldiers in these regiments who did not have these supposed malarial attacks, with the object of finding out whether these men were more or less susceptible to attacks of typhoid fever.

In conducting this investigation we have followed by name, company, and regiment every soldier in these 19 regiments of the Second Army Corps who was admitted to sick report with any form of febrile disturbance, no matter what diagnosis was given to the latter, and have only excluded those in which the febrile condition was afterwards plainly shown to be a part of the typhoid attack. All other cases have been reckoned under the head of "Preceding malarial diseases," since this was the diagnosis largely given to these cases. We have included, of course, supposed malarial attacks occurring during the month of June, when typhoid fever

did not prevail. Had we excluded these cases, which we might have properly done, and only included those shorter fevers which prevailed during the epidemic of typhoid fever—namely, during July, August, and September—the percentage of these cases which were afterwards followed by typhoid fever would have been still less.

The results obtained from this investigation are embodied in the following table:

Table showing cases of typhoid fever among men with or without preceding malarial disease.

Regiment.	Mean strength.	Cases of malaria.	Typhoid fever with preceding malaria.		Men not having had malaria.	Typhoid fever without preceding malaria.		Total cases of typhoid fever.
			Number of cases.	In 100 malarial cases.		Number of cases.	In 100 individuals without malaria.	
Third Missouri	1,168	211	7	3.3	957	91	9.5	98
Fourth Missouri	1,192	236	3	1.2	956	119	12.4	122
Seventh Ohio	1,272	210	1	.4	1,062	100	9.4	101
Seventh Illinois	1,203	174	1	.5	1,029	50	4.8	51
First Connecticut	1,303	149	12	8	1,154	127	11.0	139
Twenty-second Kansas	1,215	300	1	.3	915	51	5.5	52
First New Jersey	1,343	106	.....	.....	1,237	35	2.8	35
Sixth Pennsylvania	1,234	56	1	1.7	1,178	34	2.9	35
One hundred and fifty-ninth Indiana	1,194	303	1	.3	891	80	8.9	81
Eighth Pennsylvania	1,049	201	2	.9	848	89	10.5	91
Twelfth Pennsylvania	823	164	3	1.8	659	104	15.7	107
Third Virginia	1,123	109	.....	.....	1,014	39	3.8	39
Second Tennessee	1,096	175	3	1.7	921	85	9.2	88
Thirteenth Pennsylvania	795	179	.....	.....	616	97	15.7	97
First Rhode Island	1,085	538	10	1.8	547	211	38.5	221
Sixty-fifth New York	1,218	153	5	3.2	1,065	157	14.7	162
Sixth Illinois	1,213	289	5	1.7	924	72	7.8	77
Sixth Massachusetts	1,201	294	7	2.3	907	193	21.3	200
Third New York	1,261	236	1	.4	1,025	154	15	155
Total	21,988	4,083	63	1.5	17,905	1,888	10.5	1,951

An examination of this table will show that in a mean strength of 21,988 men there were 4,083 who experienced attacks of fever, which was generally designated as some form of malarial disease, most frequently as remittent malarial fever. Of this number, only 63, or 1.5 per cent, suffered from subsequent attacks of typhoid fever. On the other hand, of 17,905 men who did not experience any attack of supposed malarial fever, 1,888, or 10.5 per cent, contracted typhoid fever. In other words, those soldiers who had fevers of short duration, and which were generally designated as malarial fever, were seven times less liable to subsequent attacks of typhoid fever than those men who had not suffered with these milder fevers.

To put the subject in another way, of 1,951 men who had recognized typhoid fever, 63, or 3.2 per cent, had preceding attacks of supposed malarial fever, while 1,888, or 96.3 per cent, had no such preceding attacks.

We thus see that these fevers of milder form, occurring during the time when typhoid fever was epidemic in the regiments at Camp Alger, Va., conferred a remarkable immunity against subsequent attacks of typhoid fever. This was not found to be the case in only a few selected regiments, but in all regiments studied

[illegible][illegible]

Since typhoid fever is frequently manifested by symptoms of intestinal disturbance as well as fever, and since these two symptoms may be relatively more or less prominent in different cases, we have thought that perhaps many cases of this disease in more resistant individuals would occur as simple diarrheas, without attracting particular attention.

We have therefore made a like effort to ascertain what percentage of those soldiers having intestinal disturbances subsequently contracted typhoid fever, as compared with those who did not suffer from intestinal disturbances. Here, too, we have excluded those intestinal attacks which were plainly a part of the typhoid attack. The subjoined table will indicate the results obtained:

Table showing cases of typhoid fever among men with or without preceding diarrheal attacks.

Regiment.	Mean strength.	Cases of diarrheal disease.		Cases of typhoid fever with preceding diarrheal.		Men not having had diarrheal.		Cases of typhoid fever without preceding diarrheal.		Total cases of typhoid fever.
		Number.	In individuals.	Number.	In 100 individuals with diarrheal.	Number.	In 100 individuals without diarrheal.	Number.	In 100 individuals without diarrheal.	
Third Missouri.....	1,168	364	331	16	4.8	837	82	9.7	98	
Fourth Missouri.....	1,192	185	176	2	1.1	1,016	120	11.8	122	
Seventh Ohio.....	1,272	100	96	4	4.1	1,176	97	8.2	101	
Seventh Illinois.....	1,203	289	247	11	4.4	956	40	4.1	51	
First Connecticut.....	1,303	639	468	32	6.8	835	107	12.8	139	
Twenty-second Kansas.....	1,215	247	228	3	1.3	987	49	4.9	52	
First New Jersey.....	1,343	164	151	3	1.9	1,192	32	2.6	35	
Sixth Pennsylvania.....	1,234	76	69	0	0.0	1,165	35	3.0	35	
One hundred and fifty-ninth Indiana.....	1,194	180	170	8	4.7	1,024	73	7.1	81	
Eighth Pennsylvania.....	1,049	57	57	0	0.0	992	91	9.1	91	
Twelfth Pennsylvania.....	1,223	42	41	1	2.4	782	106	13.6	107	
Third Virginia.....	1,123	231	198	5	2.5	925	34	3.6	39	
Second Tennessee.....	1,096	70	70	4	5.7	1,026	84	8.1	88	
Thirteenth Pennsylvania.....	795	281	221	20	9.0	574	77	13.4	97	
First Rhode Island.....	1,085	149	137	7	5.1	948	214	22.5	221	
Sixty-fifth New York.....	1,218	97	94	4	4.2	1,124	158	14.0	162	
Sixth Illinois.....	1,213	120	108	1	0.9	1,105	76	6.8	77	
Sixth Massachusetts.....	1,201	1,746	772	35	4.5	429	165	38.4	200	
Third New York.....	1,261	317	260	18	6.9	1,001	137	13.6	155	
Total.....	21,988	5,354	3,894	174	4.4	18,094	1,777	9.8	1,951	

This table will show that of 3,894 individuals who suffered from some form of diarrheal disturbance, only 174, or 4.4 per cent, subsequently contracted typhoid fever; whereas of 18,094 men who had no intestinal disorder, not less than 1,777, or 9.8 per cent, fell victims to typhoid fever.

In other words, those soldiers who were free from attacks of diarrhea were more than twice as liable to contract typhoid fever. Indeed, if we deduct those cases of typhoid fever in which the attack of diarrhea occurred during the month of June, at a time when typhoid fever had scarcely begun, and which diarrheas could not, therefore, have been protective, we find that the percentage of those subsequently contracting typhoid fever falls still lower. In order to determine this point we herewith submit a table relating to four

regiments of the Second Army Corps, taken at random, in which the cases of typhoid fever preceded by diarrheas occurring during the month of June have been excluded:

Table showing cases of typhoid fever among the men of four regiments of the Second Army Corps (taken at random) with or without preceding diarrheal attacks, June diarrheas excluded.

Regiment.	Mean strength.	Cases of diarrheal disease.		Cases of typhoid fever with preceding diarrheal.		Men not having had diarrheal.		Cases of typhoid fever without preceding diarrheal.		Total cases of typhoid fever.
		Number.	In individuals.	Number.	In 100 individuals with diarrheal.	Number.	In 100 individuals without diarrheal.	Number.	In 100 individuals without diarrheal.	
Third Missouri.....	1,168	364	331	2	0.6	837	82	9.7	84	
Seventh Illinois.....	1,203	289	247	2	.8	956	40	4.1	42	
Thirteenth Pennsylvania.....	795	281	221	6	2.7	574	77	13.4	83	
Third New York.....	1,261	317	260	4	1.5	1,001	137	13.6	141	
Total.....	4,437	1,251	1,059	14	1.3	3,368	336	9.9	350	

An examination of the foregoing table will show that the men who suffered from diarrheal attacks during those months when typhoid fever was prevailing at Camp Alger, Va., were seven times less liable to contract typhoid fever than those who had no diarrhea.

Taking the total number of recognized cases of typhoid fever in these nineteen regiments, viz, 1,951, we find that 174, or 8.9 per cent, were preceded by diarrheal, while 1,777, or 91.9 per cent, had no previous diarrheal disturbance.

We therefore conclude that many of these supposed diarrheas were really manifestations of infection by the typhoid bacillus, since we can not otherwise account for the protective influence here so strikingly manifested.

We believe that the facts which we have here gathered point irresistibly to the conclusion that at Camp Alger, Va., in addition to the occurrence of a large number of recognized cases of typhoid fever of average duration and severity, there were a still larger number of milder infections appearing as simple diarrheas or as fevers of short duration. We shall have occasion to draw the same conclusion from our study of typhoid fever in the other army corps.

ORIGIN AND SPREAD OF TYPHOID FEVER AT CAMP ALGER, VA.

There was nothing in the general topography of Camp Alger, Va., that should have made it an unhealthy camp site. Its general elevation above the Potomac River is about 300 feet, while the surface is rolling and well drained.

The lack of a good natural water supply should have prevented the rapid concentration of a large number of regiments at this point. We have already seen that one source of discomfort in the early history of the camp was the lack of sufficient water, and that to this

was added, in the case of some of the regiments, overcrowding of the camp site. Notwithstanding this, typhoid fever furnished only 1.42 cases per 1,000 men during the first forty days of the encampment.

We have already pointed out that typhoid fever was imported into this camp by a number of the regimental organizations, and that sources for additional individual infections could be found in the city of Washington and surrounding country. The origin of the disease is therefore plain.

As to the matter of the further propagation of this disease until it had assumed epidemic form, there did not appear to be any doubt on the part of the various medical officers on duty at Camp Alger at the time of our inspection but that the water supply was at fault. The condemnation of the latter and of the shacks at which food and drinks of different kinds were sold was unanimous.

Although no positive evidence showing undoubted water contamination was presented, we were, nevertheless, impressed with the possibility of this pollution of the supply, and hence, in our letter of recommendation addressed to the adjutant-general of the First Division on August 24, 1898, we emphasized the necessity for the detail of two men in each company who should look after the sterilization of the water by boiling and its careful storage in barrels.

Our subsequent careful study of the occurrence of typhoid fever by company organizations has convinced us that the spread of the disease by contamination of the water supply can not be sustained, except in the case of Company G, Twelfth Pennsylvania Infantry. This local company epidemic has been fully commented on in the history of the Twelfth Pennsylvania Infantry.

We must look, therefore, to other modes of propagation than that of the water supply.

Upon the completion of our inspection at this camp we were impressed with the possibility of the spread of typhoid fever by tent infection, although at the time we had not obtained any positive data bearing on this particular mode of propagation of the disease. It was because of this belief that we made the following recommendation:

We earnestly hope that the flooring of the tents, which has already been ordered, will be speedily put in position. It is cer-

tainly unwise to allow soldiers to sleep in the dirt and dust of their tents (as they are doing now, for instance, in the Sixty-fifth New York Infantry). Filth, possibly some of it infected with specific germs, may be and undoubtedly is brought from the most diverse sources into these tents on the feet of the men, tramped in the dust in which they sleep, and particles of it taken into their naso-pharynxes. The board thinks it possible that the epidemic in Company E, Sixty-fifth New York Infantry, was spread in that way.

Since the above recommendation was made we have, in the course of our investigation, obtained much valuable evidence bearing on this mode of infection. This will be presented under the study of typhoid fever at Camp Meade, Pa. We would therefore include tent infection as one of the agencies concerned in the spread of typhoid fever at Camp Alger, Va.

We especially recommended the most careful supervision of the company sinks, and that each soldier be required to cover his excrement with dry earth as soon as deposited. This was intended to avoid, as far as possible, the contamination of food and drink by means of flies, and also for the purpose of minimizing the possibility of contamination of the soldier's person at the company sinks. We are of the opinion that typhoid fever was spread in this camp in both of these ways.

We would also include as a factor in the spread of this disease the undoubted pollution of the soil with the urine of those suffering with typhoid fever. Cases of this disease, under the diagnosis of malarial fever of one kind or another, were repeatedly treated by the regimental surgeon throughout the entire sickness. Patients still convalescing were also returned to their respective companies.

Since the investigations of Richardson, Horton-Smith, and others have shown that the urine of the sick and convalescents from this disease frequently (20 to 25 per cent) contains typhoid bacilli in large numbers, there must have been abundant opportunity for the contamination of the soil with the specific germ.

Finally, we do not doubt that the disease was conveyed from the sick to the well in the division hospitals and that the utterly inadequate methods of disinfection of stools, of the surface of the patient's body, and of the infected bedding and clothing contributed to this mode of propagation.

CHAPTER IX.

TYPHOID FEVER IN THE SECOND ARMY CORPS AT CAMP MEADE, PA.

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GENERAL REMARKS.

This camp site was chosen as favorable ground for a second encampment of the regiments of the Second Army Corps, which had already suffered to such an extent from typhoid fever at Camp Alger, Va. It is situated a few miles west of Middletown, Pa., and on the north bank of the Susquehanna River.

TOPOGRAPHY.

A detailed topographical map of the camp site could not be obtained.^a The general elevation of the regimental camp sites above the river was about 50 to 80 feet. This site was well suited for the encampment of troops, being elevated, rolling, and exceptionally well drained. At the time of our inspection only one battalion of the Thirty-fifth Michigan Infantry was found to occupy a camp site which was rather low and not well drained. Upon the recommendation of the board this battalion was moved to higher ground. The space allotted for regiments was ample.

WATER SUPPLY.

Prior to the arrival of troops at this camp several deep wells had been bored, from which an abundance of good water was obtained. This was pumped into tanks

of sufficient capacity and from these distributed through iron pipes, under constant pressure, to the various regimental camps. During the first weeks of the encampment, prior to the laying of water mains, water was hauled to the regiments by water wagons and stored in barrels, but this crude method of water distribution was soon replaced by the means above described. These deep wells were so situated as regards regimental encampments as to be entirely free from any danger of contamination from surface drainage. The supply of water, therefore, in this encampment was abundant and of good quality.

DISPOSITION OF GARBAGE AND EXCRETA.

Garbage was deposited in open pits and frequently covered with earth, or in a few instances, such as in the Second Tennessee and Two hundred and second New York, crematories were erected for the destruction of solid garbage. Excreta also were deposited in open pits. By order of the corps commander these pits for garbage and excreta were placed on the opposite side of the regimental camps from that chosen for the location of kitchens and mess tents, and in every instance the former were removed to a considerable distance from the company tents.

^a For a sketch map of Camp Meade, see plate 4½ of vol. 2.

With regard to the sanitary condition of kitchen and company sinks, the following is extracted from the letter of the board, addressed to the adjutant-general of the Second Corps, October 8, 1898, upon the completion of an inspection of Camp Meade:

The stringent orders of the commanding general concerning the care of sinks, as to individual and immediate covering of excreta under the constant supervision of sentinels, has led to the very good sanitary condition of the sinks of the command. Exceptionally was any fecal matter found uncovered. In no command inspected by the board during the past six weeks has an equally good sanitary condition of sinks been found.

The general police of the regimental camps was excellent.

Tentage was ample, and, in addition, all tents were floored.

FIRST MARYLAND VOLUNTEER INFANTRY.

First Brigade, First Division, Second Army Corps, Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Capt. S. S. Ulrich, assistant surgeon.]

Fort Monroe, Va.—The camp of the First Battalion of the First Maryland at the mortar battery was in the woods. The site of this camp, which was about 150 yards from Mill Creek, could not possibly have been an old cemetery.

There were four latrines of frame built near the edge of the woods, furnished with tank sinks whose common drainpipe was washed by the tides of Hampton Roads. There were periods for a week at a time when the tide would not rise above the mouth of the drainpipe which led from these tank sinks, at which times, although there was hydrant water for flushing the latrines, fecal matter would lie exposed on the beach until a high tide would come. This drainpipe from the latrines extended out for 50 or 75 feet exposed upon the beach, so that the tide, when high, would cover 20 feet of the pipe. But Captain Ulrich did not think that there were six days in the month of August when the tides were high enough to cover the beach and the pipe. They had been unusually low. At low water a sand bar would be exposed which, extending nearly parallel with the beach, joined the latter by a narrow isthmus a little above the location of the latrines.

The First Battalion assisted in digging trenches around the hospital, and they also assisted in removing patients from the transports from Santiago, Cuba, from Porto Rico, and from Columbia, S. C. Convalescents from the hospital—"the pajama brigade"—strolled around their camps.

The other two (Second and Third) battalions were located in August at Old Point Comfort, near Mill Creek. Their latrines were flushed by hydrants, but were more or less dependent upon the tides for carrying off the waste matter from the drainpipes which

emptied into Mill Creek. The latrines consisted of large wooden closets with a window which was constantly open. The fecal matter was dropped into a trough and at certain times of the day was flushed out with water from the hydrants. In the First Battalion (at the mortar battery in August) the latrines were about 50 feet from the kitchens. At the beach proper (in the Second Battalion during July at the mortar battery) the kitchens were very close to the tents occupied by the men, and the latrines were only 15 steps distant. There was a great deal of trouble with flies about the latrines. They had free access to the fecal matter.

I was on duty at the "Point" when the Second Battalion was up there at the "beach" (in July) and also on duty with the First Battalion (up there in August); besides this, I was supposed to be the chief of seventeen wards at the hospital. It was about a mile and a half from the camp at the beach to where the people at the Hygeia Hotel bathed. Some say a mile, but I rode it every morning, and it seemed to me to be a mile and a half. There were employed on the work of the mortar battery 150 negroes, who used the beach for water-closets, and every morning I would see 25 or 30 negroes at stool on the sand of the beach immediately below the camp. I noticed quite a number of them, and their stools looked as if they had diarrhea. Three different times I saw the men (of the Second and Third Battalions?) with a bucket full of oysters. I spoke to the captains and advised them not to let their men eat the oysters. (It was also stated that these oysters came from that part of Mill Creek receiving sewage.) The two battalions that ate oysters from Mill Creek were the ones that had the least typhoid fever. The negroes working there during July and August were still at work when the regiment left for Camp Meade. The negroes were mostly from Phœbus, a small town directly opposite the fort, composed of low-class houses and saloons—300 or 400 of the former and probably 160 of the latter.

Five deaths occurred in the whole regiment from typhoid fever—3 at Old Point (2 in the First and 1 in the Second Battalion) and 2 at Camp Meade. The First Battalion has had altogether 3 deaths from typhoid fever. Questioned as to whether the typhoid fever in the First Battalion was scattered through the four companies, and whether all the companies of that battalion had typhoid fever, Captain Ulrich replied: "Companies A and F were principally affected; they had more men in the hospital. The other two companies (E and G) of that battalion have had small sick calls." Questioned as to whether any of the officers have had typhoid fever, Captain Ulrich replied: "Captain Pusey (commanding A Company) went home with typhoid fever, and one of the first sergeants, who was to have been made a lieutenant." The first case of typhoid fever in the regiment was that of the regimental quartermaster-sergeant. He went into the hospital one day at noon

and died the next night at 11 o'clock. He had been dragging himself around the camp for some time, but I did not pay much attention to it, because everybody had diarrhea." Asked if any of the men of the Second Battalion, which had been up there (at the mortar battery) in July, had come down with typhoid fever in August, Captain Ulrich stated: "I do not know."

The First is a battalion that, through poor management, had been poorly fed. The company quartermaster-sergeants, who should also act as commissary-sergeants, were poor managers. Their rations would be consumed before the ten days were up, and for the balance of that time they would have to shift and skirmish around for subsistence.

Camp Meade, Pa.—Captain Ulrich had charge of the regiment during the first week after its arrival at Camp Meade. In the second week he went home and had nothing to do with the sick reports. At the date of this interview (October 7) Captain Ulrich was on duty with the Third Battalion, and attended the sick call of the two companies of that battalion located at the Second Corps bakery. Asked if he had had a case of typhoid fever within a week, Captain Ulrich replied: "I have only had charge two days and sent three men to the hospital yesterday. Two of them I am a little suspicious of."

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Major Lowndes, commanding First Battalion, First Maryland.]

Camp at mortar battery, Fort Monroe, Va.—Major Lowndes, at the date of taking this testimony (October 7), was in command of the two companies of the First Maryland stationed at the corps bakery, Camp Meade, Pa., the camp of these two companies being then located in front of the Second Corps headquarters and upon much lower ground. Major Lowndes testified substantially as follows: These two companies were part of the First Battalion that was encamped at the mortar battery, Fort Monroe, Va. The men of that battalion while in camp at the mortar battery were in the habit of bathing in Hampton Roads. They did not bathe in Mill Creek. Major Lowndes himself also bathed in Hampton Roads, as a rule about the same spot where the men bathed. Almost all of the officers of this battalion bathed there, but none of them had typhoid fever except the captain of Company A. The camp at the mortar battery was fully half a mile distant from the spot where the negro laborers used the beach for defecating; it was on the shore, not on the beach.

The latrines of this battalion were flushed with hydrant water at the time of high tide. There was plenty of odor, and there was also fecal matter exposed (on the beach). I made a written complaint about that, stating there was a very objectionable odor. At one time there was an east wind blowing, and it covered up the mouth of the pipe on the beach through which the matter from the latrines was flushed away. On this

account it was impossible to flush the latrines for twenty-four hours, and when we cleaned the pipes the water was so low that the fecal matter remained for some time exposed upon the beach; moreover, there was some of this matter left on the beach at all times. (Question.) "How far from that point on the beach did the men go in bathing?" (Answer.) "Some of them bathed very close to that point. I cautioned them from time to time against bathing so near."

The men of the Second and Third Battalions below rarely visited this battalion while at the mortar battery.

The camp there was supplied with water from Newport News. This is not the same water as that used at the fort at Old Point.

On the day the men arrived from Santiago by transport this battalion dug ditches and washed clothes and everything of the kind for them. We did all that kind of work for a month, and during that time the Third Battalion did not assist in this work. You understand what I mean? When these people (from Santiago) first came, my men handled them and helped strip them and carried their clothing out. The sick men defecated in a tub at the door, and our men carried the tub away. After the Third Battalion arrived they did the same kind of duty, but the First Battalion did the bulk of it. The ditches, etc., were dug before the Third Battalion came. Captain Pusey, of Company A, left on furlough in June and returned from his furlough in July, when he went up with his men in the pines (at the mortar battery) and took the fever. He went home about the middle of August with typhoid fever. He was taken sick two weeks after his return from furlough. He was sick in quarters, lying around his tent fully a week before he left, not later than the middle of August, with a fever that was diagnosed typhoid, the diagnosis having been made at his home. But when he left the command the surgeon on duty was afraid that he had typhoid fever. While sick in quarters he had diarrhea and was taking quinine and calomel all the time to break the fever, but without avail. Company A, Captain Pusey's company, is the one that has suffered most from sickness. That now has 20 men sick in quarters. Its sick list has been falling gradually.

Question by a member of the board: "The Second Battalion was at that same camp (at the Mortar Battery) in July and came away without typhoid. Your battalion (the First) was up there during the month of August. Toward the latter part of that time typhoid fever was appearing in the various companies, so much so that a number of them have had deaths. There is a possibility that the infection came from surf bathing, but this presumption would necessitate some one or more persons returning to the command with typhoid infection and using the sinks. We wish to know whether any man, or several men, returned sick to that battalion and whether any of them afterwards became

sick? The surgeon told us that the negroes (laborers) defecated on the shore. That was not a great ways from the camp?" Major Lowndes replied: "I can not recollect whether any men had returned to the command from furlough and afterwards been sent to hospital."

[Captains Wright and Adams.]

Camp at the Mortar Battery, Fort Monroe, Va.—Captain Wright, commanding Company E, First Battalion, First Maryland Volunteer Infantry, testified substantially as follows: While in camp at the Mortar Battery there were three privies for the four companies of the battalion and one privy for the officers—all of these privies being flushed through one drain pipe.

Questioned as to whether, during the early part of the encampment of his company at the Mortar Battery, any of his men had returned from furlough, Captain Wright replied: "No, not while the company was in that encampment; but men had been away on trips home, going away well and returning in good health. One of these men became sick with a slight attack of malaria after his return, but he was not ill enough to have to go to a hospital. This man, however, went away on account of sickness; he was feeling badly and thought the trip home would do him good."

They all bathed while at the mortar battery every chance they got—once or twice a day.

The first man of Company E who got typhoid fever had never been on furlough and was quartered at "the Point." He was admitted to sick report July 30. He has been at "the Point" ever since and is still there, having been sent to the hospital when the regiment moved. On July 29 this man was sick in quarters; on the 30th he was sent to hospital and was there a month before we left. The next man taken sick with typhoid fever was admitted the 21st day of August, while the company was up in the pines (at the Mortar Battery). This man was a sergeant, but is now a lieutenant. On the 24th of August he went home on sick leave for fifteen days, but upon certificate of his local doctor the sick leave was extended. He returned to camp a week or so ago (testimony taken October 7). The brother of this man had a light attack of malarial fever, and, going home on furlough, asked for and obtained a continuance. He also did not report until one day last week. The next case was left in the hospital at Fort Monroe when the regiment left. Four fever patients were left in the hospital at Fort Monroe when the command started for Camp Meade, Pa. Captain Wright could not say whether these fever patients were supposed to be typhoid or not—the doctor had not told him.

Captain Adams, commanding Company F, First Maryland (First Battalion?), testified substantially as follows: Questioned as to whether any of his command had returned to the company from furlough during the early part of August while the battalion was encamped at the

mortar battery, Captain Adams stated: "I do not think we had any men then on furlough. I know that for a short time we had no man at all out on furlough. There were some furloughs, however, while we were up at that encampment." Captain Adams could not remember if any of these furloughed men had become sick after returning to their commands. Questioned as to how early men who afterwards had typhoid fever first became sick while at the Mortar Battery, Captain Adams said: "They commenced getting sick about the last three weeks we were up in the woods (at the Mortar Battery). Every day there would be three or four sick men at sick call. Only one of them, however, ever went from there to the hospital. They were able to get around a little bit. Since we have been at Camp Meade I have sent 10 of my command to the hospital.

I have now 12 men on sick report (October 7); 3 we furloughed; 8 in division hospital at Camp Meade, and 1 in hospital at Old Point Comfort (Fort Monroe). I have lost 1 man. He had been sick only a few days from the time when he was well and hardy. On the second morning of his illness I told him that he was a sicker man than he seemed to be, and he was then sent to the division hospital, and the day following to the Pennsylvania Hospital, in Philadelphia, where he died. I have had no new cases recently."

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORT.

May.—(Fort Monroe, Va., Post Hospital.) Companies A to H, forming two battalions of First Maryland Volunteer Infantry, arrived May 26, and the sick were treated in the post hospital until the command went to Camp Meade, Pa., September 7, 1898. Averages of mean strength not taken, as other commands are included in the sick report, which is signed by Maj. Calvin De Witt, surgeon, who makes no remarks.

June.—(Fort Monroe, Va., Post Hospital.) Companies A to H, comprising two battalions of the First Maryland Volunteer Infantry. Signed by Calvin De Witt, major and surgeon, who makes no remarks.

July.—(Fort Monroe, Va., Post Hospital.) Companies A to M of the First Maryland Regiment Volunteer Infantry. Signed by Calvin De Witt, major and surgeon, who makes no remarks.

August.—(Fort Monroe, Va., Post Hospital.) Companies A to M of the First Maryland Volunteer Infantry. The report is signed by Calvin De Witt, major and surgeon, who makes no remarks.

September.—(Fort Monroe, Va., Post Hospital, and Camp Meade, Pa.) Companies A to M of the First Maryland Volunteer Infantry left the post September 7, 1898, en route to Camp Meade, Pa. The sick report is signed by Calvin De Witt, major and surgeon.

September.—(Camp Meade, Pa.) Mean strength averaged for thirty days: Officers, 46; enlisted men, 1,230; total, 1,276.

Admitted from command, 48; total to account for, 48. Of completed cases, all, 44, were transferred to other hospitals. Remaining on sick report, 4. The report is signed by Maj. Clement Claude, surgeon in charge, who makes no remarks.

October.—(Camp Meade, Pa.) Companies E and F were acting as a provost guard at the corps bakery, and were put under the care of an acting assistant surgeon October 1 by the direction of the chief surgeon, Second Army Corps. The report is signed by William B. Summerall, acting assistant surgeon.

October.—(Camp Meade, Pa.) Companies A to M, First Maryland Volunteer Infantry. Mean strength averaged for thirty days: Officers, 50; enlisted men, 1,177; total, 1,227. Total to account for, 56. All of these were transferred to other hospitals. This sick report is signed by Maj. Clement Claude, surgeon, who makes no remarks.

November.—(Camp Meade, Pa.) Mean strength averaged for ——— days: Officers, 49; enlisted men, 1,151; total, 1,200. Admitted from command, 25; from other sources, 2; total, 27. Of 22 completed cases, 5 returned to duty; 1 died; 16 were transferred to other hospitals. Remaining on sick report, 5.

Abstract of remarks by W. Clement Claude, major and surgeon:

One man, Private Company H, was sent to City Hospital, Augusta, Ga., by order of the brigade commander, and there died of appendicitis. At that time there was no military hospital to which he could be sent.

December.—(Camp McKenzie, Ga.) No data or remarks in indorsement.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FIRST MARYLAND VOLUNTEER INFANTRY.

Brief outline of the medical history.—The first two battalions of this regiment assembled at Pimlico, Md., on the 25th of April, 1898, and remained in camp there until the 25th of May, when they went to Fort Monroe, Va., to assist in guarding that military post. In response to the second call for volunteers the Third Battalion was mustered (date not known) and joined the regiment at Fort Monroe on the 6th of July. During the month of July the Second Battalion was encamped at the mortar battery to guard that important point, and was replaced there during the month of August and until the 9th of September by the First Battalion. With these exceptions, while at Fort Monroe this regiment was encamped "at the Point" in detachments on what low ground they found available near the post hospital, being much cramped for space. On the 9th of September the regiment left Fort Monroe, Va., for Camp Meade, Pa., to join the Second Army Corps, reaching that national camp by rail the same day. Arrived

at Camp Meade, Pa., the regiment was assigned to the First Brigade, First Division of the Second Army Corps, and went into camp with the Thirty-fifth Michigan and the Tenth Ohio, the other two members of this brigade direct from their respective State camps. (The Seventh Ohio was also for a time attached to this brigade, having come from Camp Alger, Va., under orders for muster out. See its history under Camp Alger.) On going into camp at Camp Meade Companies E and F of the First Battalion were detached and stationed for a month or more at the corps bakery, near the canal, as provost guard, about 3 miles distant from the regimental camp. The Third Battalion was also detached on provost-guard duty in Middletown for three weeks in October. The regiment remained at Camp Meade until the 15th of November, when it started by rail to join the other members of its brigade in Camp McKenzie, at Augusta, Ga. Although the detailed records we have of this regiment cease at the end of November, it seems that the command was still at Camp McKenzie as late as the 31st of December, 1898, and it is certain that the regiment was not mustered out of the service of the United States until February 28, 1899, at Augusta, Ga.

The medical history of the First Maryland, as given by the board, covers a period of seven months and five days. Of this time, thirty days were spent at the State camp, one hundred and seven days at Fort Monroe, Va., and sixty-seven days in the national camp at Camp Meade, Pa.

There is no reason to believe that the First Maryland had any typhoid fever while in its State camp or carried the infection of this disease with it to Fort Monroe. It is very clear, however, that when it moved from Fort Monroe to the national camp near Middletown, Pa., it was already quite extensively infected with typhoid fever. As to the definite source of this infection there remains some doubt after weighing all of the more or less disjointed and imperfect testimony obtainable by the board concerning the conditions surrounding and affecting the men in their various camps at Fort Monroe. (See testimony of medical and line officers of this regiment.) The epidemic of typhoid fever in the First Maryland, undoubtedly well started before it reached Camp Meade, had practically come to an end by the time the command left that camp for another national encampment in the South.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the commencement of attacks were recorded as closely as they could be ascertained.

[First Maryland Volunteer Infantry; mean strength, 1,251.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from diseases.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	All other.
June	13	5	1	18	1	1	1	1	1	1
July	2	2	1	3	2	3	2	3	11	1
August	1	2	1	3	11	5	9	23	37	4
September	1	1	1	3	13	3	23	14	39	1
October	10	1	1	10	6	1	3	5	8	1
November	5	1	1	5	1	1	1	1	1	1
December	1	1	1	1	1	1	1	1	1	1
Total	32	7	2	41	33	11	34	51	96	7

a One typhoid death on January 5, 1899, included in above total of 7.

The above tabulated deaths by disease by months were distributed among the companies of the regiment as follows:

	Company.									Staff.	Total.
	A.	B.	C.	D.	E.	H.	I.	M.			
Typhoid	1	1	1	1	1	1	1	1	1	7	5
Other diseases	1	1	1	1	1	1	1	1	1	1	5
Total	2	1	1	1	1	3	1	1	1	12	

The following is a series of three tables showing by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (a) who have had no other recorded attacks (of the categories we have been considering), and (b) who have had such other attacks.

Combinations of typhoid fever in the First Maryland.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined)	6	2	2	4	14	4	7	1	3	3	2	2	2	50
Probable typhoid (uncombined)	5	3	2	2	3	3	2	1	3	6	2	1	1	33
Typhoid beginning in diarrhea	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Probable typhoid preceded by diarrhea	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total certain typhoid	6	2	2	4	15	4	7	1	3	3	2	2	2	51
Total probable typhoid	6	3	2	2	3	3	2	1	3	6	2	1	1	34
Total probable and certain typhoid	12	5	4	6	18	7	9	2	6	9	2	3	2	85

Combinations of continued or malarial fever in the First Maryland.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined)	2	3	1	4	5	5	3	2	1	3	2	1	1	30
Short malaria preceded by diarrhea	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Two attacks short malaria	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Long malaria (uncombined)	2	1	1	1	1	1	1	1	1	1	1	1	1	10
Long malaria preceded by diarrhea	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total short malaria	2	3	1	4	5	7	3	2	1	3	2	1	1	33
Total long malaria	3	1	1	1	1	1	1	1	1	1	1	1	1	11

Totals include malaria in typhoid combinations.

Intestinal disorders in the First Maryland.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea	2	1	3	2	6	7	1	1	1	1	1	3	1	26
Short and long diarrhea	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Short and prolonged diarrhea	1	1	2	1	1	1	1	1	1	1	1	1	1	1
Single long diarrhea	1	1	2	1	1	1	1	1	1	1	1	1	1	6
Prolonged diarrhea	4	3	5	2	9	9	1	1	1	1	3	1	1	3
Total diarrhea	4	3	5	2	9	9	1	1	1	1	3	1	1	41

Totals include diarrhea in malaria and typhoid combinations.

The records of sickness in this regiment were found to be very incomplete and to some extent conflicting. By way of illustration: We have found in the medical records relating to this regiment 21 cases of so-called short malaria, etc., whose final disposition was not indicated. How many of these were really typhoid fever and should have been added to the total number of probable attacks of typhoid fever in the above summary table it was impossible for us to estimate. Furthermore, we have encountered at least one case of typhoid fever of which neither the beginning nor the end is dated. Naturally, this case does not appear in the above tabular statement, the initial date being wanting. And, again, we have learned of one fatal case of typhoid fever of which the only record we have been able to find was that of the death and the cause thereof as returned to the Adjutant-General's Office. Moreover, although this regiment was not mustered out until the 28th of February, 1899, we found no sick report from it relating to December, 1898. The above tabular statement should in our opinion be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the First Maryland Volunteer Infantry as a member of the First Brigade, First Division, of the Second Army Corps, as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(a) This regiment was in its State camp at Pimlico, Md., from April 25 to May 25, 1898; it was at Fort Monroe, Va., from May 25 to September 8, the First and Second Battalions changing camp sites once; it was in the national camp, Camp Meade, Pa., from September 9 until November 15, during which time the Third Battalion and half of the First Battalion were detached on special duty for about a month; it is to be presumed that the regiment was in the national camp at Camp McKenzie, near Augusta, Ga., from November 17 to December 31, 1898, and it was mustered out there February 28, 1899. The initial date of the first probable attack of typhoid fever was August 2; of the first certain attack of typhoid fever was July 30. It is clear, herefore, that when this regiment reached Fort Monroe, Va., it did not carry with it the infection of typhoid

fever. It is equally certain that typhoid fever was acquired at this Government post, and that a developing epidemic of the disease was transported with the regiment when it moved to Camp Meade, Pa. The medical history of the First Maryland Volunteer Infantry as given by the board covers a period of seven months and six days (from April 25 to November 30, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorder, 41; of so-called short malaria, etc., 33; of so-called long malaria, etc., 11; of probable typhoid fever, 34, and of certain typhoid fever, 51. Total attacks of probable typhoid fever (long malaria, etc., included), 96.

(c) Total deaths from typhoid fever, 7; total deaths from all diseases, 12; mortality per cent of total probable typhoid attacks, 7.29; of certain typhoid attacks, 13.72; per cent of typhoid deaths to all deaths by disease, 58.33.

(d) The mean strength was 1,251. The per cent of typhoid morbidity to mean strength, as to total probable typhoid attacks, was 7.67, while the average for the brigade was 21.98; as to total certain typhoid attacks it was 4.07, while the average for the brigade was 12.70. The number of typhoid deaths per 1,000 of mean strength was 5.59, while the average for the brigade was 13.77, and the average for the division was 12.55.

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) Although the extent of typhoid fever in the First Maryland was not great, yet the same general remarks which have been made under this head concerning other regiments may be regarded as applicable also to this regiment. It is only when we study the course of sickness, as we have frequently said, in the regimental organizations from the standpoint of individual companies that we can adequately appreciate the fact that the course of disease in the regiment is characterized by a series of company epidemics, each one having more or less perfectly its own individual characteristics. This is especially true when we regard the commencement, the exacerbations during the course, and the termination of the company epidemics; and when thus regarded they are rarely seen to be synchronous. Not only are there variations in these company epidemics, considered as integral parts of the regimental organizations, but there is, as a rule, no striking similarity in the course of the epidemics even in companies grouped together in battalion organizations. These dissimilarities in the course of company epidemics appear in the First Maryland to be on their face incompatible with the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means of propagation of these epidemics.

Reference to the graphic chart and to the foregoing tabular statement gives ample evidence of this truth, and it is unnecessary to illustrate further by entering into details here. It appears that the formation of the First Battalion was A, E, G, F; Third Battalion, M, H, L, I, while the order of the companies in the Second Battalion is not known.

(b) This regiment can also be said to have had company epidemics of greater or less exacerbations in their course, and the intervals between these exacerbations were, as a rule, closely coincident with the average period of incubation of typhoid fever.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) With regard to the service of the regiment at Fort Monroe, Va., previous to arrival in the national camp at Camp Meade, Pa., attention may be recalled to the foregoing statements of the various officers, both line and staff, of the regiment concerning special service of the men in the battalions while at Fort Monroe. It will be remembered that the surgeon in charge of the regiment and the major in command of the First Battalion advanced the suggestion that the origin of typhoid fever in this regiment might have been due to the handling by the men of the First Maryland of sick soldiers from Porto Rico and Santiago, arriving by the transport *Washington* and others, somewhere about the 20th of July. It will be remembered also that during the month of July the Second Battalion was stationed up at the Mortar Battery in a separate camp, 2 or 3 miles removed from the First and Third Battalions, on special duty of guarding that battery; and that it was chiefly, if not exclusively, the men of the First Battalion who engaged in the service of handling the sick soldiers while removing them from the transports to the post hospital, which latter was located in the close vicinity of the camps of the First and Third Battalions at "The Point." The men of the battalions then located at "The Point" were also engaged in other duties in connection with the policing of the post-hospital grounds. It will also be remembered that during the month of August the First and Second Battalions exchanged positions and duties. Thus was the Second Battalion succeeded by the First Battalion in the occupancy of the separate camp up at the Mortar Battery. This regiment it will be remembered left Fort Monroe, Va., on the 9th of September, arriving at the national camp at Camp Meade, Pa., the same day. Reference to the graphic chart of this regiment shows that ten days after the 20th of July, the date of the arrival of the sick soldiers from the West Indies, there was 1 case of typhoid fever developed in Company C. The chart also shows two attacks of typhoid fever in company B on the 2d and 4th of August, and one attack in Com-

pany I on the 7th, and one attack in Company D on the 9th of August. All of these companies experiencing attacks of typhoid fever within what may be regarded as an incubation period after the handling of the sick soldiers from the transports occurred in companies constituting the Second Battalion up at the Mortar Battery at that time, except the 1 case in Company I, which was a member of the Third Battalion. With regard to this latter company the graphic chart will show no other subsequent cases of typhoid fever recorded until the 23d of October. The first case of typhoid fever occurring in the First Battalion was that in Company E on the 18th of August, about a month after the handling of the sick soldiers above mentioned. The graphic chart indicates that there was no epidemic of typhoid fever in any company of this battalion or of the regiment anterior to the 8th of September. It is clear, therefore, that we must exclude the handling by the soldiers of this command of the sick soldiers from Porto Rico and Santiago as the origin of typhoid fever in the regiment. Reference to the chart indicates that the only companies which may be regarded as being extensively infected at the time of the departure of the regiment from Fort Monroe, Va., were Companies A, E, F, and G of the First Battalion, at that time located at the Mortar Battery.

(b) As to special duty at Camp Meade, Pa., the Third Battalion, Companies M, L, H, and I, were on provost-guard duty at Middletown, Pa., from about the 5th of October to the 26th. The surgeon says: "Their health while on provost duty was relatively good." The graphic chart shows that it is chiefly after the Third Battalion rejoined the regimental camp that the little typhoid fever they had occurred. Two companies, E and F, of the First Battalion, which when the regiment reached Camp Meade on the 9th of September were experiencing considerable typhoid fever, were immediately upon their arrival in the national camp stationed at the Second Corps bakery, and were on the 6th of October still there, separated from the regimental camp, and the surgeon of the regiment said of them on the latter date that "their health is remarkably improved." The graphic chart, however, shows that this remarkable improvement in health was more imaginary than real, for both companies continued to experience the development of fresh attacks of typhoid fever as late as October 15, which latter date terminated their respective epidemics. A and G, the other companies of the First Battalion, remained in the regimental camp at Camp Meade, and the surgeon in charge declares of them also on the 6th of October that "their health is now remarkably improved also." While the graphic chart shows that this statement is measurably substantiated, these companies also continued to experience trouble from typhoid fever for some time after that date.

THIRTY-FIFTH MICHIGAN VOLUNTEER INFANTRY.

First Brigade, First Division, Second Army Corps, Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Capt. H. A. Grube, assistant surgeon.]

Island Lake, Mich.—Captain Grube could not be definite about the time of assembling of the regiment at the State encampment at Island Lake, but thought it was about the 10th or 12th of July. The first company was mustered in July 10, a company being mustered in every day or two after that until mustering was completed. The field and staff were mustered in on the 25th of July. After mustering, all of the men were given leave of absence for two days, and most of them went home for that time. The regiment remained in camp there until about the 17th of September.

This ground is the site of the State encampment where the National Guards are annually mobilized. The camp was located on gravel soil and had been used by the State volunteer regiments since the first call for troops early in the spring. The Thirty-fifth Michigan occupied the same ground that had been previously occupied by the Thirty-first, Thirty-second, Thirty-third, and Thirty-fourth Michigan regiments, and used the same company streets. The sink buildings and the kitchen buildings had been built some years by the State for the use of the annual encampment of the State troops. There is a large tank reservoir, and the water is distributed under pressure from it in iron pipes throughout the encampment to the rear of the company streets. The camp is located about half a mile distant from a small lake, and the water was pumped up into the above-mentioned tank from one or more shallow wells less than 50 feet deep near the edge of the lake—lake water infiltrated through the soil.

Captain Grube thought these wells were liable to pollution from the lake, and perhaps from other sources.

The wells furnishing the water supply of the regiment were distant about 60 rods from the latrine pits used by the companies. These latrines were upon higher ground than the wells, but they were on another side of the camp, on the edge of another swampy piece of ground leading to the river, and it is believed that the latrines drain toward the river, not toward the lake.

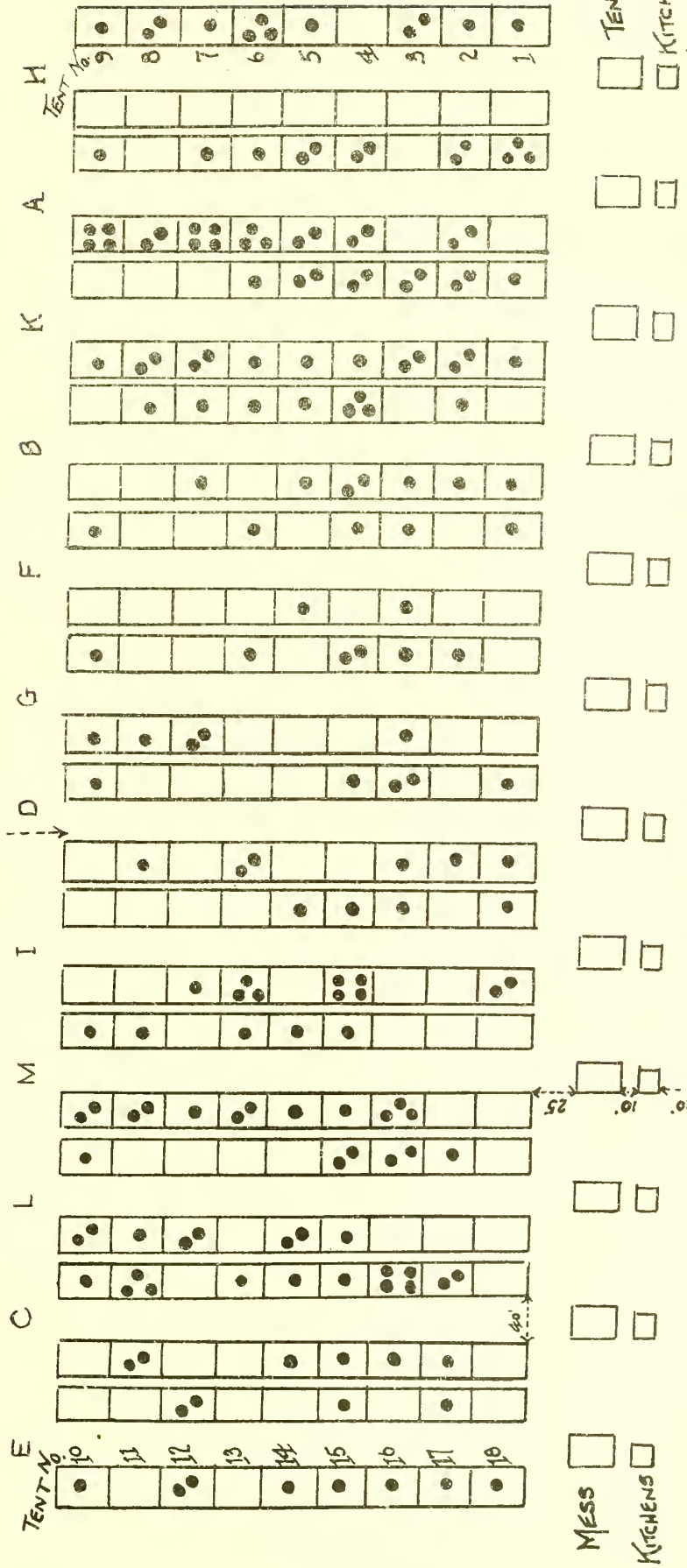
There were company sinks at first 150 feet distant from the mess tents; as they were filled up and new ones dug they were farther removed from time to time, finally as far back as 300 feet from the mess tents. The sinks were quite at the latter distance when typhoid fever began to make its appearance in the regiment. They were moved back to the greatest distance some time in the latter part of August or the first part of September.

The companies were furnished with A wall tents, the

OF LATRINES.

LINE

150'



LINE OFFICERS' TENTS

LINE OFFICERS' TENTS.

LINE OFFICERS' TENTS

ROUGH PLOT OF THE 35TH MICHIGAN
AT CAMP EATON, ISLAND LAKE, MICHIGAN Aug 10
CAMP MEADE, PENN.

REGIMENTAL
HEADQUARTERS.

• = TYPHOID ATTACKS

same tentage that the regiment continues to use. The tents were pitched and ready for the men when they arrived at Island Lake, and they were floored from the beginning. The men were not overcrowded in these tents, there being seven men to a tent in some, but generally there were only five or six. Neither before nor after the appearance of typhoid fever in the regiment was there any special disinfection of the tentage, bedding, or clothing of any of the men of these companies. But as soon as a man fell sick at Island Lake he was taken to the hospital and got out of his company tent. His blankets, shoes, and clothing all went with him to the regimental hospital.

There was a regimental hospital during the whole time of the encampment at Island Lake, and nearly every case of sickness was treated there up to convalescence. The stools of the sick in the hospital were disinfected with bichloride (1:1,000) and put into the hospital sink. This sink was also used by other men. The linen was disinfected if soiled. It was taken off every day and washed. The attendants at the hospital were instructed to disinfect their hands. There was no case of typhoid fever which developed among them.

Dry earth and lime were thrown upon the excrement in the sinks once a day. The floors and seats of the latrines were scrubbed. In fact, the latrines were kept sanitarily clean. The colonel had had quite a little experience in sanitary matters, and the officers of the day kept the latrines free from odor. Flies were not plentiful as compared with the number at Camp Meade. "We had nothing like the numbers we now have. In fact, we were not annoyed with them."

The milk supply was furnished by a milkman and a company. The source of the supply was a few miles distant, near Howell. "This was the exclusive supply of milk consumed in the camp for a while, until we had two attacks of tyrotoxicon poisoning and shut it off. The command had been furnished with this supply for about a month before it was discontinued. About two weeks after shutting off this milk supply we began to have cases of typhoid fever in the command." It is to be noted that the milk supply before mentioned went to all the companies. Company F came down with 86 cases of tyrotoxicon poisoning in one day, and then in a week or so afterwards Company M had a similar attack, 53 cases, very much milder. Remark by the board: "You speak of the tyrotoxicon affecting two whole companies at different times, and yet that milk supply was furnished all alike."

Captain Grube felt convinced that none of the Michigan regiments preceding the Thirty-fifth on that camp site had had typhoid fever. This disease began to appear in the Thirty-fifth the middle or latter part of August. Its development was slow until about the 1st of September, when there began to be a number of cases. The typhoid was not at that time generally scattered throughout the various companies, but was

found to be much localized and generally confined to three companies. The first case of typhoid fever was in Company C, followed by another in the same company after two weeks; but they were not in the same tent.

Companies A and K were side by side, and about two weeks later Company K experienced quite an epidemic, having 12 or 13 cases. For nearly two weeks no other company was affected in this way; then (about the 1st of September) the neighboring company, A, began to have the fever in an epidemic form.

Most of the typhoid fever occurring in this regiment had thus far fallen upon three companies, A, C, and K, the other nine companies having had very little. Captain Grube thought that there were some companies that had no typhoid fever at all, or at least very little, perhaps a case scattered here and there in a company.

Questioned as to the peculiar conditions found in Company K, Captain Grube stated: "We had an analysis made of the water at Island Lake and found it impure. We endeavored to enforce the rule of boiling the water very strictly and inspected the water every day, looking into the method of boiling the drinking water at the company kitchens. It was also filtered. But we found out afterwards that Company K's cook had been cheating the officers and had not boiled the water as we had supposed. I think the same thing must have occurred in Company A. We thought the captains of these companies had their men under strict discipline, but once in a while they would pretend to boil the water, and there were some days on which it was not actually done. The companies where the water was really boiled did not have trouble. The men did not like to drink the boiled water, and would, whenever they could, fill their canteens in the evenings from the neighboring farmhouses. On this account we did not secure a strict limitation to the use of boiled water. I inquired at one farmhouse where they got their water, and the people there claimed they never had any sickness. But the well the men were getting their water from was in the barnyard. I endeavored to impress the men who were following this practice with the proper appreciation of the danger of it, but they had to be thoroughly scared before they would abandon it."

It was not until the outbreak of disease in Company K that there was an endeavor made to restrict the command to the use of boiled water. There was no great outbreak of fever in Companies A and K after the first considerable ones, yet each of these companies continued to have scattered cases. In fact, these two companies have had most of the typhoid fever of the regiment. They are still experiencing some attacks since leaving the State encampment. "I attribute this latter experience to another fact. I discovered that the railway company which transported the company from

Island Lake to Camp Meade had filled the water tanks of their cars with the same polluted water of the Island Lake supply. The consequence has been that occasional sporadic cases, scattered here and there, appeared seven, eight, or twelve days after arrival at Camp Meade. The disease is now (October 7) abating."

The first lieutenant of Company K had typhoid fever, and he had been using the water furnished for the company. "I have no doubt it was the water furnished from the company barrels, for there was no other stored in the camp." He was taken sick on the 28th of August and was sent home September 7, where he has remained ever since. Another lieutenant of that company (K) has had the fever, developed September 24, and was sent to the First Division Hospital. The captain of this company went away yesterday (October 6) with symptoms of typhoid fever.

These were not the only officers of the regiment affected with the fever. The second lieutenant of Company A has had it. Captain Grube thought the first case of typhoid fever in the regiment was from this company. He was entered upon the sick report July 28 and kept in hospital until August 8, when he was sent home on sick leave. The cases recorded in the regimental books were as follows: From Company M a private admitted August 15; a private from Company M, August 20; one from Company A, August 23; one from Company C, August 26; from Company L two were admitted on August 26; from Company K two, August 28; August 31, one from Company K; September 4, one from Company D; one from Company F on the same date; on September 8 a man was admitted from Company D.

Diarrhea has been prevalent in the command since the beginning of the organization. It continued all the time, and we have diarrhea still. It seems to be simple diarrhea, without any elevation of temperature. Every morning we found and still find some cases at sick call. The first week or ten days after going into camp at Island Lake there was so much of it that it led to an investigation of the water supply. The diarrhea diminished after instituting the boiling of water—that is, among those companies which respected the order—but, as has been said, it has continued all the time and still continues.

There was some indistinct malaria while the regiment remained in Michigan. There would be cases with an evening temperature and none in the morning, without the diarrhea or other symptoms which might suggest typhoid. These cases would yield to quinine and soon go back to duty. The men were not sick enough to go to hospital, but perhaps sick enough to be kept from going at once to duty. At Island Lake a 5 o'clock sick call was established, in addition to the ordinary morning call, in order that the men might be watched more closely. The regiment had been at the State encamp-

ment about a month when it was found desirable to establish this additional sick call.

Camp Meade, Pa.—The regiment removed to Camp Meade on the 17th of September. The camp site here is a good one, the only objection being that the battalion at the farther end of the camp is situated upon ground that is too low and flat. The rain water, however, does not stand upon it long, but flows off.

All the solid kitchen garbage is burned in the crematory. The drinking water used is that of the general water supply of Camp Meade. The regiment is furnished with Maignen filters, which are in use at the company kitchens. The method of disposal of feces is that of pits dug in the ground, and the fecal matter is covered by each man immediately after it is deposited. There is a sentinel stationed at the sink requiring this to be done.

There are some cases of distinct intermittent fever occurring. The majority of them yield to quinine in five or six days and go back to duty. Since coming to Camp Meade there is much less typhoid fever than at Island Lake.

ABSTRACT OF SUPPLEMENTARY TESTIMONY.

[Capt. H. A. Grube; taken November 1, 1898.]

Camp Meade, Pa.—It was the First Battalion of this regiment which was occupying the very low ground as noted at the time of the first visit of the board, on October 7, Companies E and C being lowest down and Companies L and M on slightly higher ground. The band was still lower down than the lowest company. About a week after the board's first visit the lowest company, E, and the band were moved to higher ground near the brigade headquarters. About a week after that Company C was also moved to the higher ground and placed beside Company E. Company C had had some typhoid fever at the Island Lake, Mich., encampment. The first case in the regiment at Island Lake, as has been stated, was in Company C, and several cases of typhoid fever had developed in this company at Camp Meade before it was moved to the higher ground. Company E of this battalion used boiled water while at Island Lake and was the healthiest there, having no typhoid fever at that camp. About two weeks after the regiment came to Camp Meade two or three cases developed in that company, and on the 20th and 21st of October there was a sudden large accession of fever in it, most of which proved to be typhoid, 17 cases being reported in one day. Thereupon Company E moved to the high ground, as before mentioned. The more severe of these cases were sent to the division hospital.

After removal to the higher ground the health of these companies improved immediately—that is to say, within twenty-four to forty-eight hours. After this marked temporary improvement a slow development of

typhoid fever began again, about 6 cases being sent to hospital, while the doubtful cases, which were also mild, were retained in quarters and treated there. No deaths have as yet occurred among any of these recent cases. Company E, as has been stated, began to get sick about two weeks after arriving at Camp Meade. Although it had used boiled water at Island Lake, it consumed while en route to Camp Meade the water supplied by the railroad company. (See remarks concerning the nature of that water in the original testimony.) Furthermore, about two days before the accession above mentioned heavy rains fell, which engulfed the site of their camp. The band, on the other side of Company E, developed sickness at Camp Meade, including some cases of typhoid, none of them having had disease at Island Lake. Their sickness commenced a week after their arrival at Camp Meade and has ceased since moving to the higher ground.

Company C was moved to higher ground after Company E moved, and it continued to have a few cases from time to time. At Island Lake, Mich., there had been no sudden outbreak in this company as in Companies A or K. Of late, however, the fever in this company is abating. Company C was in the Philadelphia Peace Jubilee military parade.

Captain Grube thinks there has been no new infection of Company E since moving to the higher ground.

At Camp Meade all the companies of this regiment began to use boiled water about October 24. There has been little diarrhea in the regiment since coming to Meade, and no accession of it in Company E since the introduction of boiled water in the regiment here. Moreover, there has been less intestinal disturbance of any kind in the company since that date.

The Second Battalion, consisting of Companies G, F, I, and D, was at this time (November 1) out on provost duty, Companies D and I being in the city of Harrisburg and Companies G and F scattered between Camp Meade and that city. This is the first outpost duty which the regiment has had.

Abstract of remarks by Capt. Howard A. Grube, surgeon in charge:

While at Island Lake, Mich., the regiment became infected with typhoid fever through impure drinking water, as per last month's report. We left quite a number of sick in the hospitals and at home on sick leave and tried to bring only healthy men to this camp. The railroad company transporting the regiment filled their water tanks with unsterilized water at Island Lake, Mich., and in a short time after arriving at Camp Meade typhoid fever developed. Malaria has also developed to quite a marked degree, presumably due to climatic change and influence.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 38; enlisted men, 980; total, 1,118.

Remaining from last month, 53; admitted from command, 275; total to account for, 328. Of 262 completed cases 134 returned to duty; 1 died; 1 discharged; 126

transferred to other hospitals. Remaining on sick report, in quarters, 66.

Maj. O. P. Barber, surgeon, who signs the report, makes no remarks.

November.—(Camp Meade, Pa., and Camp McKenzie, Augusta, Ga.) Mean strength averaged for thirty days: Officers, 40; enlisted men, 1,050; total, 1,090.

Remaining from last month, 66; admitted from command, 117; total to account for, 183. Of 155 completed cases 116 returned to duty; 1 discharged; 38 transferred to other hospitals. Remaining on sick report: In hospital, 12; in quarters, 16.

This regiment left Camp Meade, Pa., for Camp McKenzie, Augusta, Ga., November 19, 1898.

Maj. O. P. Barber, surgeon, who signs the report, makes no remarks.

December.—(Camp McKenzie, Augusta, Ga.) Mean strength averaged for thirty-one days: Officers, 42; enlisted men, 1,070; total, 1,112.

Remaining from last month, 28; admitted from command, 117; total to account for, 145. Of 113 completed cases 68 returned to duty; 1 discharged; 44 transferred to other hospitals. Remaining on sick report: In hospitals, 2; in quarters, 30.

Maj. O. P. Barber, surgeon, who signs the report, makes no remarks.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE THIRTY-FIFTH MICHIGAN VOLUNTEER INFANTRY.

Island Lake, Mich., and Camp Meade, Pa.—Capt. H. F. Sands, commanding Company A, furnished a list of his men grouped in tents at the Island Lake, Mich., camp and stated substantially as follows: The First Battalion was composed of Companies E, C, M, L; the Second Battalion of Companies I, D, G, F; and the Third Battalion of Companies B, K, A, and H.

Company A was not on any detached service while at Island Lake. Ten per cent of the company was from the country, the balance from small towns of from 1,000 to 6,000 population.

Typhoid fever in the Thirty-fifth Michigan started in Company K. I am unable to assign any cause. From that company it went through the entire regiment. I think the extent of the disease was about the same in each company.

Capt. William G. Fleishauer, commanding Company L, furnished a list of men grouped in tents on each side of the company street and stated substantially as follows: This list shows the way the men were placed at first, and this order was practically unchanged until the middle of October, when we were issued six 7 by 8 tents, at which time I placed two or three men in each of these new tents, but I have no record now as to what men were placed in the new tents.

The companies were camped from right to left, as

follows (the number and position of battalions not given): At Camp Eaton: E, C, L, M; I, D, G, F; B, K, A, H. At Camp Meade: E, C, L, M; I, D, G, F; B, K, A, H. The second arrangement at Camp Meade is as follows: L, M; L, D, G, F; B, K, A, H; E, C. At Camp McKenzie, Ga.: E, C, L, M; B, H, K, A; D, E, I, G.

While at Camp McKenzie, Ga., my company was on detached service, provost duty in the city of Augusta, Ga., from March 1 to March 25, 1899.

This company came chiefly from a rural population, most of them from the farm or from very small villages in the northern part of Michigan. The intelligence of the men was above the average as found in this country. I found that my men were careless as to personal conduct and habits affecting their health. Their financial status was rather below the average—that is to say, they came from the laboring men and farmers.

I do not think there was any difference as to the severity of sickness in any of the companies of our regiment.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

August.—(Camp Eaton, Island Lake, Mich.) Mean strength averaged for —— days: Officers, 47; enlisted men, 1,275; total, 1,322.

Remaining from last month, 1; admitted from command, 290; total to account for, 291. Of 147 completed cases, 146 returned to duty and 1 died. Remaining on sick report: In hospital, 24; in quarters, 27.

Abstract of remarks by Maj. O. P. Barber, major and surgeon:

Typhoid caused us trouble to the extent that we shut off the entire milk supply, which was being furnished by the State. The best care we could give did not prevent serious sickness in one entire company, many of them being in such collapse that hospital care was needed.

Typhoid, as the report shows, has quite a foothold, the cases being very mild, the cause being plainly attributed to the water supply. When first ordered here every possible precaution was ordered, and, where possible, maintained. Analysis by Prescott, of the University of Michigan, Ann Arbor, was had on two specimens at that time (six weeks ago); injection of culture killed white rats in twelve hours. Strict orders were issued as to boiling the water, and use of ice in drinking water was prohibited. But many men on the sly would use ice and drink nonsterilized water, and some officers were careless and skeptical ("all-nonsense" chaps). Now that the seed is sown the lesson is learned, and the strictest precautions on their part are prompt and voluntary, and I hope the bulk of trouble is over.

September.—(Camp Meade, Pa.) Mean strength averaged for thirty days: Officers, 41; enlisted men, 1,070; total, 1,111.

Remaining from last month, 43; admitted from command, 371; total to account for, 414. Of 361 completed cases, 132 returned to duty; 3 died; 1 discharged; 225 transferred to other hospitals. Remaining on sick report, in quarters, 53.

CONSIDERATION, BY THE BOARD, OF TYPHOID FEVER IN THE THIRTY-FIFTH MICHIGAN VOLUNTEER INFANTRY.

Brief outline of the medical history.—This second-call regiment assembled at Camp Eaton, Island Lake, Mich., about the 10th of July, 1898. Mustering was completed by the 25th of July, when all the men were given leave of absence for two days, of which most of them availed themselves to go home. The regiment remained encamped there until the 14th of September, during all of which time (according to the surgeon in charge) it was camped upon the identical ground previously occupied by the first-call Michigan regiments (viz, the Thirty-first, Thirty-second, Thirty-third, and Thirty-fourth), and (also according to the same authority) it used the same company streets, kitchen buildings, and latrine buildings. On the 14th of September the regiment left by rail for the national camp in Pennsylvania, arriving at Camp Meade on the 16th, when it was assigned to the First Brigade, First Division of the Second Army Corps and went into camp with the First Maryland and Tenth Ohio—the two other members of this brigade which also came to the national camp direct from their respective State camps. (The Seventh Ohio, arriving from Camp Alger, Va., was also temporarily attached to this brigade while at Camp Meade under orders to be mustered out. See history of this regiment under Camp Alger.) While the Thirty-fifth Michigan was at Camp Meade two companies (E and C), with the band, at first on low ground, which became flooded during heavy rains, moved to higher ground near the brigade headquarters about the 14th and 21st of October, respectively. With these exceptions the regiment remained without change at Camp Meade until it left for Camp McKenzie, near Augusta, Ga., the 10th of November. On the 31st of December, 1898, the regiment was still in Camp McKenzie. It was mustered out of the service of the United States at Augusta, Ga., the 31st of March, 1899.

The medical history of this regiment by the board ends on the 31st of December, 1898, and therefore covers a period of five months and twenty days. Of this time, about sixty-five days were passed in the State camp at Island Lake, Mich., fifty-five days were spent at the national camp in Pennsylvania, and forty-nine days at the national camp in the South.

This regiment suffered severely from typhoid fever while in its State camp, and it continued to suffer heavily after it settled in the national camp near Middletown, Pa. The origin of the epidemic in the State camp still remains more or less obscure. In this connection and in addition to preceding portions of the testimony bearing upon this point, there may be something pertinent in the history of those Michigan regiments of the first call which preceded the Thirty-fifth Michigan in the occupancy of the State camp. (See histories of these regiments.) Neither the Thirty-

second nor the Thirty-third Michigan appear to have had typhoid fever at the State camp or to have carried the infection into the national camps. Of the other two the following may be briefly recapitulated here: The Thirty-first Michigan assembled at Island Lake the latter part of April, 1898, was mustered there by May 8, and reached the national encampment at Chickamauga Park on May 17. After a full discussion of this regiment the board says: "It is therefore probable that this regiment went to Chickamauga (from its Island Lake camp) infected with typhoid fever." The Thirty-fourth Michigan was mustered in May at Island Lake, Mich., and arrived thence at Camp Alger, Va., on the 9th of June, transporting with it a case of typhoid fever, although the regiment had shown none of this disease at the State encampment. Thus the Thirty-fifth Michigan arrived at its State camp at Island Lake about fifty-eight days after the departure of the Thirty-first Michigan and about thirty-four days after the departure of the Thirty-fourth Michigan. Before passing on we might also mention as interesting experiences of the Thirty-fifth Michigan while in its State camp the so-called tyrotoxicon outbreaks (limited to Companies D, F, and M) which occurred in the early part of August. (Refer to surgeon's testimony.)

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained.

[Thirty-fifth Michigan Volunteer Infantry; mean strength, 1,150.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	All other.
July.....	4	1	.....	5	.....	.....	.....	1	1	.....
August.....	73	3	2	78	22	4	.....	20	24	1
September.....	57	13	1	71	50	30	38	148	216	3
October.....	43	3	1	47	38	29	7	92	128	15
November.....	8	1	.....	9	12	5	4	6	15	3
December.....	.....	.....	.....	.....	1	.....	1	2	3	.....
Total.....	185	21	4	210	123	68	50	269	387	21

One "other death," on January 5, 1899, included in above total of 4.

A rectification of the total number of so-called long malaria, as given in the above summary table, should be made by reducing the total of 68 to 66, thus requiring a corresponding reduction of the number of total probable typhoid-fever attacks from 387 to 385.

The above tabulated deaths from disease, by months, were distributed among the companies of this regiment as follows:

	Company.											Total.
	A.	B.	C.	E.	F.	G.	H.	I.	K.	L.		
Typhoid	4	1	5	1	1	1	.....	2	1	2	21
Other diseases .....	.....	.....	.....	.....	.....	.....	1	1	1	1	4
Total.....	4	1	5	1	1	1	1	3	2	3	25	

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have not had other recorded attacks (of the categories we are considering) and (*b*) who have had such other attacks:

Combinations of typhoid fever in the Thirty-fifth Michigan.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Certain typhoid (uncombined).....	38	18	25	20	23	7	15	25	13	27	8	19	1	239	
Probable typhoid (uncombined).....	3	1	4	1	2	...	5	1	8	8	10	4	...	47	
Typhoid beginning in diarrhea.....	...	1	1	1	...	...	...	...	...	1	1	2	...	7
Typhoid preceded by diarrhea.....	1	1	3	...	2	2	1	...	...	3	1	2	...	16
Probable typhoid preceded by diarrhea.....	...	...	...	...	...	...	...	...	1	...	...	...	...	1
Typhoid preceded by malaria.....	...	...	...	...	2	1	...	...	...	2	1	...	...	6
Probable typhoid preceded by malaria.....	...	...	...	...	...	...	1	...	...	...	...	...	...	1
Combinations of three diseases.....	...	...	...	...	1	...	...	...	...	1	...	...	...	2
Total certain typhoid	39	20	29	21	27	10	16	25	13	32	12	24	1	269	
Total probable typhoid.....	3	1	4	1	3	...	6	1	9	8	10	4	...	50	
Total probable and certain typhoid	42	21	33	22	30	10	22	26	22	40	22	28	1	319	

Combinations of continued or malarial fever in the Thirty-fifth Michigan.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Short malaria (uncombined).....	8	10	13	3	10	9	6	1	9	9	10	10	.....	100
Short malaria preceded by diarrhea.....	2	1	.....	.....	4	.....	1	1	.....	.....	.....	.....	.....	9
Short malaria followed by diarrhea.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	1	.....	.....	3
Long malaria (uncombined).....	6	3	9	3	13	3	10	1	1	6	.....	4	.....	59
Long malaria preceded by diarrhea.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	5
Long and short malaria.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	2
Two attacks long malaria.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1
Total short malaria.....	10	11	13	5	18	10	8	2	10	12	13	11	.....	123
Total long malaria.....	6	6	9	3	13	3	10	3	2	7	2	4	.....	68

Totals include malaria in typhoid combinations.

Intestinal disorders in the Thirty-fifth Michigan.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Single short diarrhea.....	11	11	5	10	8	25	12	12	15	10	5	12	.....	136
Two attacks short diarrhea.....	.....	1	.....	2	2	2	.....	.....	1	1	.....	.....	.....	9
Single long diarrhea.....	.....	.....	1	2	1	1	.....	1	.....	2	4	1	.....	13
Prolonged diarrhea.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....	.....	3
Total diarrhea.....	14	18	9	16	21	32	15	15	18	22	15	15	.....	210

Totals include diarrhea in malaria and typhoid combinations.

The records of sickness in this regiment were found to be very incomplete and to some extent conflicting. By way of illustration: We have found in the medical records relating to this regiment 20 cases of so-called short malaria, etc., whose final disposition has not been indicated, and, vice versa, 10 cases of so-called malaria and 3 of intestinal disorder had no initial date given and naturally were not tabulated at all. Again, 5 cases without diagnosis of any kind recorded, and either the initial date or the final disposition omitted, were not tabulated by us for lack of sufficient data to classify. How many of these cases were really typhoid fever and should have been added to the total probable typhoid attacks in the above summary table it is of course impossible for us to estimate. That at least some, possibly many, of them were of a typhoidal nature we think can not be reasonably questioned. Moreover, we have encountered 4 recognized cases of typhoid fever which we could not tabulate for lack of proper initial dates. The above tabular statement should therefore, in our opinion, be regarded as an underestimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including mortality and morbidity) of the Thirty-fifth Michigan Volunteer Infantry as a member of the First Brigade and First Division of the Second Army Corps as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(a) The regiment was in its State camp at Island Lake, Mich., from about July 10 to September 14; it was in the national camp, Camp Meade, Pa., from September 16 to November 10; it was in the national camp, Camp McKenzie, Ga., from November 12 to December 31, 1898, and it was mustered out March 31, 1899, at Augusta, Ga. The initial date of the first probable typhoid-fever attack was the 2d of August, and the first certain typhoid-fever attack was July 28. This regiment developed a decided epidemic of typhoid fever while at its State camp at Island Lake, Mich., and it arrived in the national camp, Camp Meade, Pa., with the epidemic still progressing. The medical history by the board covers a period of five months and twenty days (from about the 10th of July to the 31st of December, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 210; of so-called short malaria, etc., 123; of so-called long malaria, etc., 66; of probable typhoid fever, 50; of certain typhoid fever, 269. Total attacks of probable typhoid fever (long malaria, etc., included), 385.

(c) Total deaths from typhoid fever, 21; total deaths from all diseases, 25; mortality per cent of total probable typhoid attacks, 5.45; of total certain typhoid attacks, 7.80; per cent of typhoid deaths to all deaths by disease, 84.

(d) The mean strength was 1,150. The per cent of typhoid morbidity to mean strength: As to total prob-

able typhoid attacks was 33.47, while the average for the brigade was 21.98; as to total certain typhoid attacks was 23.39, while the average for the brigade was 12.70. The number of typhoid deaths per 1,000 of mean strength was 18.26, while the average for the brigade was 13.77 and the average for the division was 12.55.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Thirty-fifth Michigan:

Disease.	Individuals.	Average age.
Short intestinal disorders	105	23.3
Long intestinal disorders	13	21.9
Prolonged intestinal disorders	3	23.8
Total intestinal disorders	121	23.2
Short malaria, etc.	82	24.5
Long malaria, etc.	72	23.8
Probable and certain typhoid attacks	289	23.1
Total	361	23.2
Grand total all above classes	564	23.4
Seventeen soldiers who died from typhoid fever.		25.1

For comparison of these average-age figures with similar data relative to other regiments in this brigade and division, we refer to the general tables treating of this subject at the head of the Second Army Corps at Camp Meade, Pa.

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) It is only when we study the course of sickness in the regimental organizations from the standpoint of individual companies that we can adequately appreciate the fact that the course of disease in the regiment is characterized by a series of company epidemics, each one having more or less perfectly its own individual characteristics. It is especially true when we regard the commencement, the exacerbations during the course, and the time of termination of the company epidemics that they are rarely seen to be synchronous. Not only are there variations in these company epidemics considered as integral parts of the regimental organization, but there is, as a rule, no striking similarity in the course of the epidemics even in companies grouped together in battalion organizations. These dissimilarities in the course of company epidemics in the Thirty-fifth Michigan would appear to be upon their face incompatible with the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means of propagation of these epidemics. Reference to the graphic chart gives ample evidence of this truth, and it is not necessary to illustrate by entering into details. It appears that the arrangement of the companies in the camp at Island Lake, Mich., where this regiment began to suffer severely from typhoid fever,

was, according to a diagram map furnished by the regimental surgeon, from right to left, as follows: E, C, L, M, First Battalion; I, D, G, F, Second Battalion; B, K, A, H, Third Battalion.

(b) The company epidemics have frequent greater or less exacerbations in their course, and the intervals between these exacerbations are, as a rule, closely coincident with the average period of incubation of typhoid fever. A close examination from this standpoint of the foregoing tabular statement or of the graphic chart^a will more or less definitely substantiate this statement. The truth of it becomes especially evident if, instead of recording the course of typhoid fever by means of the Arabic numerals in the foregoing tabular form, we indicate each individual attack of typhoid fever by a dot in the square corresponding to the proper date.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) Company D was detached from the regiment on duty at Highspire, Pa., near Camp Meade, from November 1 to 14. Reference to the graphic chart will show that the typhoid fever in this company ceased to appear on the 26th of October. It can not therefore be said that the detachment of the company from the regiment exercised any influence upon the course of serious sickness.

SPECIAL CHARACTERISTICS OF CERTAIN COMPANY EPIDEMICS, AS EXHIBITED BY THE GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN TENTS, VIEWED FROM THE STANDPOINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) We have endeavored to ascertain the names of soldiers as they were grouped in their tents during the period of the encampment at Island Lake, Mich., and at Camp Meade, Pa., in order to examine into this important question. To this end we have requested such data from two different sources, namely, from the regimental surgeon and from the commanding officers of companies. The acting regimental surgeon in charge, in response to our request, has furnished a diagram map of the camp of the Thirty-fifth Michigan as at Island Lake, Mich., and Camp Meade, Pa., indicating the number of attacks of typhoid fever as they occurred in their respective tents. This diagram was accompanied by a list of names, with rank and date of commencement of the typhoid-fever attacks referred to by the surgeon in his diagram. (The communication from the surgeon in charge accompanying this plot bore the date of October 11, and it is to be inferred, therefore, that the attacks of typhoid fever returned by the surgeon include all attacks of this kind up to the date of the communication.) We have made use of this diagram map and list of the acting surgeon in the construction

of the rough plot of the camp of the Thirty-fifth Michigan at Island Lake, accompanying this text, wherein we have plotted in their respective tents the attacks of typhoid fever referred to in the list of the acting surgeon. These plotted attacks show a marked limitation to certain groups of men in tents. These squad groups of the sick, as plotted in their respective tents, would seem to be incompatible with the assumption that the chief factor in the propagation of typhoid fever throughout the regiment may have been some agency whose influence was common and pretty constantly acting upon the whole command. On the contrary, they would appear to suggest a mode of disseminating infection which more effectively reached and acted upon certain limited groups or squads of men, while it passed by others, which would be entirely compatible with the assumption of a dominant tent, squad, or comrade infection.

(b) A further indication of the existence and active influence of a tent, squad, or comrade infection throughout this command is the following result of a careful analysis we have made of the records of sickness in this regiment in connection with the grouping of infected men in their tents, and the average time elapsing between successive or "connectable" attacks in the same tent or in adjoining tents. Of 189 attacks of typhoid fever plotted, 124, or 65.60 per cent, were separated or "connectable" by periods which could fairly be regarded as measuring average periods of incubation of typhoid fever. Furthermore, we have obtained directly from the captains commanding two companies of the Thirty-fifth Michigan lists which enabled us to make a similar calculation independent of the information obtained from the surgeon in charge of the regiment. Of 74 attacks of typhoid fever plotted, 51, or 68.91 per cent, were separated or "connectable" by periods which could fairly be regarded as measuring an average period of incubation of typhoid fever. (For fuller details concerning this matter, refer to the tables showing the number and per cent or "connectable" attacks of typhoid fever in tents, as deduced from the surgeons' and from the captains' tent lists of certain regiments in the Second Army Corps at Camp Meade, and regiments of the Second Division, Seventh Army Corps, at Jacksonville, Fla. See also a general discussion of this subject.)

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation of this disease from data obtained from two different sources, and we have found a striking coincidence in the average of the figures thus obtained.

(a) Period of incubation as deduced from the length of intervals between "connectable" attacks of typhoid fever occurring in the same or in adjoining tents. As deduced from the surgeon's tent list, in 189 cases of typhoid fever plotted 78 intervals between attacks

^a Morbidity chart 68, vol. 2.

which could fairly be regarded as measuring the length of an incubation period were obtained. The average length of these 78 intervals was 9.9 days. As deduced from the captains' tent lists of companies, in 74 cases of typhoid fever plotted there were 40 intervals which could fairly be regarded as measuring an average period of incubation. The average length of these 40 intervals was 10.5 days.

(b) Period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid fever attacks. The Thirty-fifth Michigan furnished 11 examples of attacks of diarrhea preceding typhoid fever by periods which could fairly be regarded as measuring a period of incubation. The length of the intervals in these cases averaged eleven days.

TENTH OHIO VOLUNTEER INFANTRY.

First Brigade, First Division, Second Army Corps, Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. W. A. Westervelt, surgeon.]

Columbus, Ohio.—The regiment assembled at Columbus, Ohio, the 25th of June and was mustered in by July 7. It remained there until the 18th of August.

While there the command was supplied with the city water.

At that camp the method of disposal of fecal matter was as follows: There were dug pits. The fecal matter was covered with earth and plenty of lime. But it was impossible to dispose of this matter properly. The regiment was camped on low ground, and in the spring when the troops went there the pits could be dug only about 18 inches before striking water. Hard rains would fill them up. Occasionally it would be impossible to cover the fecal matter, which would float at the surface of the water. On account of the extreme shallowness of the sinks it was necessary to dig a great many of them.

The regiment was in this camp four or five weeks before typhoid fever made its appearance. There were one or two genuine cases. Other fevers, however, existed of a low malarial character. At one time there were about a dozen of these. These lower types began to appear four or five weeks after the regiment came to that camp. Upon leaving the State camp 21 patients were left behind there. One or two of them died. One of them died through the carelessness of his mother.

Camp Meade, Pa.—The regiment came to Camp Meade on the 18th of August, and it went into camp on a piece of low, swampy ground near the railroad, living in shelter tents from Saturday until Wednesday. No matter how dry the ground got in the sun, it would get damp at night. The regiment afterwards moved to higher ground. Some of the companies are living in bunks which the men have built 2 or 3 feet from the

ground. Some of them are "double-deckers." In these companies there has been less sickness, and in the double-deckers it is only in the lower bunks where a man is taken sick.

There was not much sickness during the first and second weeks at Camp Meade. The sickness began during the third week there. There is some typhoid fever at present (this testimony was taken about the 7th of October). This fever seems to be of a mixed character; some of the temperatures run up, and some of the men stay in hospital four or five days. With the diet at the hospital they improve and are able to take a thirty-day furlough. Some of these men remain in hospital and develop cases of typhoid fever. At the present time we are having very few of such cases. There have been several cases of genuine chills and fever with marked chills, some of them, however, having only slight chilly sensations. The surgeon stated that he could not tell exactly what the sick report of the regiment is to-day (October 7) because men are being dropped and sent to the general hospital. He thought, however, that they had about 79 in hospital and in quarters. The regiment is a full one, with 12 companies and 106 men to the company.

[Lieut. J. J. Erwin, assistant surgeon.]

Camp Bushnell, Columbus, Ohio.—In April, at the time of the first call for volunteers, 8 regiments of infantry, 1 battalion of infantry, 2 battalions of cavalry, and 1 battalion of artillery went into camp at Camp Bushnell, Columbus, Ohio. There had been no preparation for them. No sinks had been prepared or anything of that kind. There had been, however, a water supply installed from the city waterworks at Columbus by extending the pipes from the latter out upon the top of the ground to the location of the camp. "I went into this camp on the 15th day of April, according to my recollection. From that time on for at least eight or nine days, look any time you would into the fields around that camp and you would see fifty to one hundred to two hundred men defecating. That continued until sinks were dug for the accommodation of the men. I think this state of affairs continued eight or nine days. The sinks were at length provided, and a week or ten days thereafter the rumor passed around that they were infested with 'crabs,' and the men deserted the closets for the fields again until the former were disinfected by the use of bichloride, when, after about a week, the men were induced to resort again to the sinks. In the course of time these men left Camp Bushnell and went to other camps."

On the 25th of June the Tenth Regiment of Ohio Volunteers went into camp on the same grounds that had been previously occupied by two infantry regiments, namely, the Second and Sixth Ohio. The men of the Tenth, instead of using the water from the hydrants of the city supply, preferred to use the water

from a number of farmhouse wells around the encampment. These wells were resorted to by the men during the first ten days or two weeks after their arrival at Camp Bushnell. "Within seven days I was treating 16 cases of typhoid fever, and the typhoid continued until I succeeded in getting permission from the colonel to build a filter. For the construction of this filter I took 3 barrels, holding 40 gallons each, placed them one above the other, so that the water could be drawn from the upper into the lower one. The pipe running from the supply pipe was carried up to the top barrel, with a stopcock, allowing me to let the water into the barrel as I liked. In the second barrel I placed alternate layers of baked gravel and powdered charcoal, filling this barrel two-thirds full. The next barrel below was the receptacle or reservoir for the filtered water. After the water was filtered it passed through a coil of 38 feet of pipe inclosed in a box, within which I placed 200 pounds of cracked ice every morning, this box having a tap at the end for the withdrawal of melted water. I would fill the top barrel with 40 gallons of water and put into it 1 ounce of chemically pure hydrochloric acid, whereupon the top of the water would be covered with a green scum in fifteen minutes, of such a kind as you see on pools of water. The filter took that out, and the water running through these 38 feet of coiled pipe furnished the men practically pure and cold water. Guard lines were placed around the two [farmhouse wells], and no person was allowed to drink any water, except that which came from this filter."

Lieutenant Erwin also stated that about the same time of the installment of the filter which he had devised a captain who had charge of the quartermaster's department of the Regular Army purchased from the city of Columbus what was supposed to be distilled water in cans. "I had several samples from these cans, and they contained plenty of good-sized wrigglers, which would have made mosquitoes in twenty-four hours. That was issued in barrels to the men, but they did not go for that water very much, for I had my filter already established. They would come after the filtered water with their cups. I have seen 100 men in a line at the cooler." There was but this one cooler, of very large size, established for the use of the whole regiment. The distilled water above mentioned was obtained from an ice-manufacturing plant in Columbus. After the use of this filter typhoid fever began to decrease. According to the recollection of Lieutenant Erwin, 28 men of the regiment were left behind sick in the Columbus Barracks when the command moved to Camp Meade.

Lieutenant Erwin gave substantially the following testimony with regard to the sinks of the Tenth Ohio at Camp Bushnell: The sinks were very bad. They could not be dug beyond 3 feet without reaching water. His advice was that the sinks should be dug less than 3 feet in order to avoid the water, but his cautions were not

always regarded. A little lime was used in these sinks. "It did very little good to throw a trifle of lime into a pool of water filled with the defecations of men. The consequence was that a fearful odor came from the sinks that made it very disagreeable for the men to use them." The sinks were about 60 feet distant from the kitchens and mess tents, and there was much trouble with flies.

The men of the regiment were not sleeping directly on the ground while at Columbus, but their tents were floored while there.

Another matter: There were two points in the camp which were very low. There was a great deal of rain, and often the men located in these low places had to get up in the night and dig trenches in order to keep the water out of their tents. In those companies where the ground was low there was more typhoid.

Companies I and K had more typhoid than others. These were composed of men who had all the money they wanted to spend, and they lived luxuriously. They were more self-indulgent as to drinks and pastries purchased outside of the camp, and they had, consequently, more sickness.

The milk supply was brought in by milkmen who made it their business. They were not licensed, as far as Lieutenant Erwin knew. Neither was the milk inspected by anyone. He could not say if there was much raw milk consumed in the camp, for there were many men who had money, and they bought whatever they wanted.

Camp Meade, Pa.—The regiment arrived at Camp Meade some time in August, but Lieutenant Erwin was unable to fix the date. It appears by inference from Lieutenant Erwin's remarks that the Tenth Ohio immediately upon its arrival went into camp at a point whence it was subsequently moved into two other camps. As to the second camp Lieutenant Erwin makes the following remarks: "I was inspector there from the 4th to the 17th (of September?), and in my second or third report handed in I find with reference to the second camp that the guards were not close enough. There was a stream of water flowing back of the camp, which was subsequently guarded so that the men could not reach it except for the purpose of washing their clothing. It was not an unusual occurrence, however, to hear the men boast how much better the stream water was than that which they could get in camp. Companies F and D were nearer that stream, and it was these companies that had more typhoid than all the rest of the regiment together. In that camp the men laid on the ground until five or six days before we moved into this (the third?) camp. One battalion moved here (to the third camp at Meade?) two weeks before the others, which were on provost duty at Middletown. The eight companies at Middletown were L, C, A, B, H, I, K, and G. The four companies which came to this camp were F, D, M, and E.

"The men on provost duty fared better than did those

remaining in camp. They had all the accommodations they wanted and got all they wanted to eat and drink, and they escaped—that is, they suffered much less from—typhoid fever, while those remaining in camp got the fever severely. These eight companies were on provost duty at Middletown and the neighborhood near Camp Meade. Their tour of provost duty began on the fourth day after their arrival here from Ohio, and they remained on that duty three weeks."

Lieutenant Erwin stated that he had no reason to suspect the milk supply of having anything to do with the development and spread of typhoid fever in the Tenth Ohio.

As to the water supply: "I was supposed to inspect the water supply that was used for drinking and cooking, and the food supply as well, and I looked into these matters very thoroughly. I have no reason to suspect that the typhoid germs came from the water supply furnished officially, but the men may have gotten water outside of the supply furnished by the Government. If the Government water supply had been furnished as it was intended to be used, I do not believe that typhoid fever could have occurred in that camp." Lieutenant Erwin was of the opinion that the Berkefeld filters furnished the troops were not practicable, as there has been so much difficulty in using them. "If a man could be created with three hands, he could use the Berkefeld filter—one hand to hold the filter, one to pump, and one to hold the cup." About August 12 an order was issued that the water be boiled and filtered. Instructions to this effect were issued.

As to the history of typhoid fever in the Tenth Ohio after its arrival at Camp Meade, Lieutenant Erwin referred the board to his report, which had been forwarded to the chief surgeon of the corps. In addition to what he had already said of typhoid fever in Companies F and D, Lieutenant Erwin stated that they had not been out on provost duty.

ABSTRACT OF A COMMUNICATION FROM THE COMMANDER
OF COMPANY B OF THE TENTH OHIO VOLUNTEER INFANTRY.

Camp Bushnell, Columbus, Ohio, and Camp Meade, Pa.—Capt. E. N. Ogram, commanding Company B, stated substantially as follows: The following is the order of companies in the Second and Third Battalions at Camp Meade, commencing on the right: Second Battalion, Companies G, K, I, and H; Third Battalion, Companies B, A, C, and L; the order of companies in the First Battalion is not remembered.

There was a great deal of typhoid and malarial fever in our regiment; and, in fact, among all the troops at Camp Meade. I thought at the time that in our case we had brought germs with us from Columbus, Ohio, for at that place we had camped on ground where several thousand troops had recently been encamped. At every hard rain the sinks overflowed and, as I suppose, spread disease. When, however, troops began to come

in from Michigan, Minnesota, Pennsylvania, Maryland, New York, and other States, we began to learn that those men were in as bad shape as ours; and I made up my mind that we had been mistaken in our theory.

From the general aspect of Camp Meade, it should have been a very healthy camp, every individual camp being upon an incline. The surface drainage was good and well cared for. The water was fine and, I believe, pure. The latrines were covered with earth, shaded, and at a safe distance from quarters.

Although sickness and death occurred in some companies more than in others, I would not want to say that it came from nonattention on the part of the commanding officers. The company to my right had 6 or 7 deaths. Our company had 1 death. One of the deaths in Company A was from an accident. I do not think that one tent suffered more from disease than another, nor that those on the north side were more unhealthy than those on the south side.

The floors of our tents were taken up very frequently and scrubbed and thoroughly aired. The side walls of the tents were raised nearly every day.

I think our entire regiment was on provost duty at Camp Meade, each company about twenty-one days, and that our battalion was on such duty about the 20th of August.

My company was composed mostly of city men, of average intelligence and reasonable prudence as to personal habits affecting their health. Their financial status was slightly below the average.

This company did not suffer as much from disease as most other companies, but I am ashamed to say that they were just as bad as others when it came to venereal troubles. There were lots of the latter in all of the regiments. It may have been why there was so much fever afterwards. With us, as with other regiments, I think there was just as much average sickness among the officers as among the enlisted men.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL
MONTHLY SICK REPORTS.

June.—(Camp Bushnell, Columbus, Ohio.) Command: Three batteries of artillery, 4 divisions naval reserves, 5 companies of infantry for muster into the Tenth Ohio Volunteer Infantry, 1 company for First Ohio Volunteer Infantry, 1 company for Second Ohio Volunteer Infantry, 2 for the Third Ohio Volunteer Infantry, 2 for the Fifth Ohio Volunteer Infantry, 1 for the Sixth Ohio Volunteer Infantry, 1 for the Seventh Ohio Volunteer Infantry, and 1 for the Ninth Ohio Battalion.

Surg. W. A. Westervelt gives no further data.

July.—(Camp Bushnell, Columbus, Ohio.) Mean strength averaged for—— days: Officers, 46; enlisted men, 1,279; total, 1,325.

All the companies recruited for other regiments were forwarded July 8.

Completed cases, 215. (No other figures given)

Abstract of remarks by Surg. W. A. Westervelt:

Owing to age of camp and the fact that the ground is low and composed of clay a great deal of malaria is resulting. Recommendations to remove the camp have been repeatedly made.

August.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,275; total, 1,321. Completed cases, 372.

This is all the data Surgeon Westervelt gives.

September.—(Camp Meade, Pa.) Mean strength averaged for thirty days: Officers, 45; enlisted men, 1,256; total, 1,301. Remaining from last month, 7; admitted from command, 326; total to be accounted for, 333. Of 333 completed cases, 166 returned to duty, 3 died, 146 transferred to other hospitals, 18 otherwise disposed of. Remaining on sick report, 0.

Surg. W. A. Westervelt makes no remarks.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 44; enlisted men, 1,237; total, 1,281. Remaining from last month, 120; admitted from command, 190; total to account for, 310. Of 190 completed cases, 97 returned to duty, 7 died, 12 discharged for disability, 4 deserted, 58 transferred to other hospitals, 1 otherwise disposed of.

Abstract of remarks by First Lieut. James J. Erwin, assistant surgeon:

The prevailing diseases in the camp during the month have been malaria and typhoid, and many cases which distinctly manifested the indications of both diseases being present at the same time in the individual. From the time when the regiment entered into the service to the time early in the month when trenches were dug for the purpose of laying water pipes through the camp but one officer had been incapacitated for duty on account of sickness. In less than one week after this digging was begun in front of the officers' quarters, malaria and typhoid, with typho-malaria, began to become manifest. Since that time 8 officers have been allowed sick leave, and few have escaped treatment in quarters for the same cause.

Among the men nearest to the trench where they were exposed to the atmosphere loaded with its germs, a like percentage of the same diseases prevailed, while those quartered farther away escaped infection in proportion thereto. It seems to be that this observation has proven without a doubt that Camp Meade is in a malarial district.

The wives of three of the officers have been quartered in farm-houses near the camp, and have eaten at officers' mess. Two of these ladies have received medical attention for diseases of a distinctly malarial type, and one child suffered from the same cause.

November.—(Camp Meade, Pa., and Camp McKenzie, Ga.) Mean strength averaged for thirty days: Officers, 44; enlisted men, 1,218; total, 1,262. Remaining from last month, 57; admitted from command, 185; total to account for, 242. Of 172 completed cases 107 returned to duty.

Maj. W. A. Westervelt, surgeon, makes no remarks.

December.—(Camp McKenzie, Ga.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,194; total, 1,240. Remaining from last month, 57; admitted from command, 130; total to account for, 187. Of 141 completed cases, 132 returned to duty, 2 discharged, and 7 transferred to other hospitals.

Remaining on sick report: In hospital, 10; in quarters, 36.

Maj. W. A. Westervelt, surgeon, makes no remarks.

CONSIDERATION, BY THE BOARD, OF TYPHOID FEVER IN THE TENTH OHIO VOLUNTEER INFANTRY.

Brief outline of the medical history.—In response to the second call for volunteers this regiment assembled at Camp Bushnell, the State camp near Columbus, Ohio, on the 25th of June, 1898, and was mustered in by the 7th of July. It should be remembered that in the latter part of April and the first half of May, responding to the first call for volunteers, 8 regiments of infantry, 2 battalions of cavalry, and 1 battalion of artillery had previously occupied Camp Bushnell and "there had been no preparation for them; no sinks had been prepared, or anything of that kind." While at the State camp, the Tenth Ohio occupied a low, ill-drained camp site, which, according to the testimony of one of the assistant surgeons of the regiment, had been previously occupied by 2 of the first-call regiments, viz, the Second and Sixth Ohio Volunteer Infantry. (See his testimony above.) The surgeon of the Sixth Ohio said of its site at Camp Bushnell, Columbus, Ohio: "Moreover, before our arrival this site had been used by adjoining troops as a general dumping ground, being literally covered with fecal matter." The Tenth Ohio remained on this ground in the State camp near Columbus, Ohio, until the 18th of August, when it started by rail for the national camp in Pennsylvania. On the 19th of August the regiment reached Camp Meade, Pa., and was assigned to the First Brigade, First Division of the Second Army Corps, and was finally encamped with the First Maryland and the Thirty-Fifth Michigan, the two other members of this brigade which came direct from their respective State camps. (The Seventh Ohio, from Camp Alger, Va., was also temporarily attached to this brigade at Camp Meade under orders to be mustered out. See history of this regiment under Camp Alger.) It should be stated that during the first five days at Camp Meade the regiment was living under shelter tents, "on a piece of low, swampy ground," which, however dry in the sun, would become damp at night. This temporary camp was located along the railroad. From this temporary camp the Second and Third Battalions (Companies L, C, A, B; H, I, K, G) were detached on provost-guard duty in Middletown and vicinity on the 23d of August, where they remained separated from their regimental camp during a tour of provost duty of three weeks, at the end of which time they joined the command and there for the first time went into camp alongside the First Maryland and Thirty-fifth Michigan. Meanwhile, on August 23, the First Battalion (Companies F, D, M, E) moved from the temporary camp site on low ground near the railroad to much higher ground 2 or 3 miles distant, where the First Brigade camp was finally located. (See gen-

eral sketch map of Camp Meade, Pa.) The regiment remained at Camp Meade until November 12, when it started by rail for Camp McKenzie, near Augusta, Ga., where it arrived about two days later. It appears that the Tenth Ohio was still at Camp McKenzie on the 31st of December, 1898, and that it was mustered out of the service of the United States on the 23d of March, 1899, at Augusta, Ga.

The medical history of this regiment as presented by the board therefore covers a period of six months and five days. Of this time fifty-four days were spent in Camp Bushnell, the State camp near Columbus, Ohio; eighty-five days in Camp Meade, the national camp in Pennsylvania (of these, five days were passed by the command on low ground near the railroad, when the regiment separated, the First Battalion going to the camp of the First Brigade on higher ground for eighty days, while the Second and Third Battalions went into Middletown for twenty-one days and then joined the First Battalion in the brigade camp to remain there fifty-nine days), and forty-seven days were spent by the regiment in Camp McKenzie, near Augusta, Ga.

The evidence in hand shows very clearly that the Tenth Ohio became extensively infected with typhoid fever while in its State encampment, and that an epidemic of this disease was already progressing when the regiment arrived at the national camp in Pennsylvania. This epidemic gained still greater proportions at Camp Meade, Pa., reaching its height there during the month of September, but in October it declined, and by the time the regiment left Camp Meade renewed infection had nearly ceased. A few scattering cases, however, continued to develop up to the end of the first week in December.

Concerning the origin of this epidemic which started in the State camp near Columbus, Ohio, it may be unnecessary to reiterate at this point the unsavory statements of medical officers of various Ohio regiments respecting the unfavorable and highly unsanitary conditions prevailing at Camp Bushnell during its occupancy by both the first and second call volunteer organizations. Among them we would refer especially to those of the Sixth and Tenth Ohio Volunteer Infantry, since the former regiment is said to have preceded the latter upon the same camp site at Camp Bushnell. How troops living under conditions so favorable to the spread of infectious matter like that of typhoid fever could long escape infection it is difficult to conceive. As a matter of fact, few infantry organizations sojourning in that camp for any considerable time did escape infection while there. Of the eight infantry organizations which mobilized at the State camp near Columbus, Ohio, and afterwards went to one or another of the national camps, the Second, Fourth, Fifth, Sixth, Seventh, and Tenth Regiments of Ohio Volunteer Infantry were infected more or less with typhoid fever before leaving the State camp.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (typhoid included) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained.

[Tenth Ohio Volunteer Infantry; mean strength, 1,228.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Total probable typhoid, including long malaria.	Deaths from diseases.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.		Typhoid.	All other.
July.....	110	7	3	120	21	18	14	3	35	.....	.....
August.....	97	13	1	111	22	13	12	19	44	1	.....
September.....	75	12	2	89	43	8	62	72	142	9	.....
October.....	9	3	2	14	46	9	28	45	82	8	.....
November.....	1	1	3	5	19	9	4	2	15	4	.....
December.....	4	1	.....	5	7	2	.....	.....	2	.....	.....
Total.....	296	37	11	344	158	59	120	141	320	22	.....

A rectification of the total number of so-called long malarias, etc., as given in the above summary table, should be made by reducing the total of 59 to 56, thus requiring a corresponding reduction of the number of total probable typhoid fever attacks from 320 to 317.

The above tabulated deaths from disease by months were distributed among the companies of this regiment as follows:

	Company.									Total.
	A.	B.	C.	F.	G.	H.	I.	L.	M.	
Typhoid	4	2	2	6	2	3	1	1	1	22

The following is a series of three tables, showing by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering), and (*b*) who have had such other attacks:

Intestinal disorders in the Tenth Ohio.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Single short diarrhoea...	10	12	12	13	9	7	12	12	14	21	16	8	.....	146
Two attacks short diarrhoea.....	1	1	4	2	4	1	4	3	...	3	1	...	.....	24
Short and long diarrhoea	.....	2	.....	1	1	1	.....	.....	.....	1	.....	.....	.....	6
Short and prolonged diarrhoea.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Single long diarrhoea.....	2	5	1	2	2	2	.....	.....	.....	.....	2	2	.....	18
Long and short diarrhoea	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1
Single prolonged diarrhoea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Prolonged and long diarrhoea.....	.....	.....	1	.....	.....	1	1	.....	1	.....	1	.....	.....	5
Total diarrhoea.....	34	29	34	32	29	24	26	36	26	31	29	14	.....	344

Totals include diarrhea in malaria and typhoid combinations.

Combinations of typhoid fever in the Tenth Ohio.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Certain typhoid (uncombined).....	15	9	5	10	8	12	10	9	2	8	7	7	1	102	
Probable typhoid (uncombined).....	8	3	8	7	6	12	9	10	11	7	6	3	1	91	
Typhoid beginning in diarrhea.....			1							1	1			3	
Probable typhoid beginning in diarrhea.....			2			1				2		1		6	
Typhoid preceded by diarrhea.....	6		1	4	3	4	2	3	3		1			27	
Probable typhoid preceded by diarrhea.....	3	3	4		2	2		1	1	1				17	
Typhoid followed by diarrhea.....						1								1	
Probable typhoid followed by diarrhea.....		1												1	
Typhoid preceded by malaria.....		1	1				2	1						5	
Probable typhoid preceded by malaria.....							1			1			1	3	
Probable typhoid followed by malaria.....			1											1	
Combinations of three diseases.....				1					1					2	
Total certain typhoid ..	21	10	8	15	11	17	14	13	7	9	8	7	1	141	
Total probable typhoid.....	11	7	15	7	8	15	10	11	12	11	7	4	2	120	
Total probable and certain typhoid.....	32	17	23	22	19	32	24	24	19	20	15	11	3	261	

Combinations of continued or malarial fever in the Tenth Ohio.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Short malaria (uncombined).....	10	6	8	5	4	11	10	5	7	5	9	3	2	85	
Short malaria preceded by diarrhea.....	6	...	2	1	...	3	2	2	3	2	4	1	.....	26
Short malaria followed by diarrhea.....	...	1	...	...	...	...	...	2	...	...	...	1	.....	4
Short malaria preceded and followed by diarrhea.....	...	...	...	...	...	...	1	...	...	...	...	...	.....	1
Two attacks short malaria preceded by diarrhea.....	...	...	...	1	...	1	...	...	...	1	...	...	.....	3
Two attacks short malaria.....	...	1	1	...	1	...	1	1	3	1	1	...	.....	10
Short and long malaria.....	...	...	...	...	...	...	...	...	...	1	...	...	.....	1
Short and long malaria preceded by diarrhea.....	...	...	...	...	...	...	...	...	...	...	1	...	.....	1
Long malaria (uncombined).....	3	1	2	3	4	1	3	...	6	8	3	2	1	37	
Long malaria preceded by diarrhea.....	1	...	1	1	1	...	1	...	2	...	1	...	.....	8
Long malaria followed by diarrhea.....	...	...	1	1	...	...	1	...	...	...	2	.....	.....	5
Long and short malaria.....	...	...	...	1	...	...	...	1	...	1	...	...	.....	3
Two attacks long malaria.....	...	...	...	...	...	...	...	1	...	...	...	...	.....	1
Total short malaria	16	9	13	9	6	16	17	16	18	11	19	5	3	158	
Total long malaria	4	1	5	6	5	1	4	1	11	9	7	4	1	59	

Totals include malaria in typhoid combinations.

The records of sickness in this regiment were found to be more or less incomplete and to some extent conflicting. By way of illustration: We have found in the various medical reports relating to this regiment 47 cases of so-called short malaria, etc., whose final disposition is not indicated. How many of these were really typhoid fever and should have been added to the total number of probable typhoid fever attacks in the above summary table it was of course impossible for us to estimate. That there were some, possibly many, we think can not be reasonably questioned. Furthermore, we have encountered the name in the Adjutant-Gen-

eral's Office of a soldier returned to that office as having died of typhoid fever, but the only medical record we have found concerning this man is that from the 13th to the 15th of September he was carried upon the regimental sick report as having an attack of acute diarrhea. The above tabular statements should, in our opinion, be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Tenth Ohio Volunteer Infantry as a member of the First Brigade and First Division of the Second Army Corps as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(a) This regiment was in its State camp, near Columbus, Ohio, from June 25 to August 18; it was in the national camp, Camp Meade, Pa., from August 19 to November 12, and during this time changed its camp site twice; it was in the national camp, Camp McKenzie, near Augusta, Ga., from November 14 to December 31, 1898, and it was mustered out March 23, 1899, at Augusta, Ga. The initial date of the first probable attack of typhoid fever was July 16, and of the first certain attack of typhoid fever was July 16. This regiment experienced a considerable development of an epidemic of typhoid fever while in its State camp near Columbus, Ohio, which was in full progress when it moved to the national camp, Camp Meade, Pa., and which reached its height while in the latter camp. The medical history by the board covers a period of six months and five days (from the 25th of June to the 31st of December, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 344; of so-called short malaria, etc., 153; of so-called long malaria, etc., 56; of probable typhoid fever, 120; and of certain typhoid fever, 141. Total attacks of probable typhoid fever (long malaria, etc., included), 317.

(c) Total deaths from typhoid fever, 22; total deaths from all diseases, 22; mortality per cent of total probable typhoid fever attacks, 6.94; of total certain typhoid fever attacks, 15.60; per cent of typhoid deaths to all deaths by disease, 100.

(d) The mean strength was 1,228. The per cent of typhoid morbidity to mean strength as to total probable typhoid attacks was 25.83, while the average for the brigade was 21.98; as to certain typhoid attacks was 11.48, while the average for the brigade was 12.70. The number of typhoid deaths per 1,000 of mean strength was 17.93, while the average for the brigade was 13.77, and the average for the division was 12.55.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by diseases we have

been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Tenth Ohio:

Disease.	Individuals.	Average age.
Short intestinal disorders	55	23.5
Long intestinal disorders	10	26.1
Prolonged intestinal disorders	3	26.3
Total intestinal disorders	68	24.0
Short malaria, etc	86	24.5
Long malaria, etc	31	23.9
Probable and certain typhoid attacks	193	23.8
Total probable and certain typhoid and long malaria	224	23.8
Grand total of all above classes	378	24.0
Fourteen soldiers who died from typhoid fever		23.2

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) It is only when we study the course of sickness, as we have frequently said, in the regimental organizations from the standpoint of individual companies that we can adequately appreciate the fact that the course of disease in the regiment is characterized by a series of company epidemics, each one having more or less perfectly its own individual characteristics. This is especially true when we regard the commencement, the exacerbations during the course, and the termination of the company epidemics; and when thus regarded they are rarely seen to be synchronous. Not only are there variations in these company epidemics considered as integral parts of the regimental organizations, but there is as a rule no striking similarity in the course of the epidemics even in companies grouped together in battalion organizations. These dissimilarities in the course of company epidemics in the Tenth Ohio would appear to be on their face incompatible with the assumption of a common, simultaneous, and more or less continuously lasting agency as the chief means of propagation of these epidemics. Reference to the graphic chart and to the foregoing tabular statement gives ample evidence of this truth, and it is unnecessary to illustrate further by entering into details here. It appears that the order of company letters in the First Battalion, composed of D, E, F, M, is not known. According to the captain of Company B the following is the order of companies in the Second and Third Battalions as at Camp Meade: G, K, I, H; B, A, C, L.

(b) These company epidemics have frequent greater or less exacerbations in their course; and the intervals between these exacerbations are, as a rule, closely coincident with the average period of incubation of typhoid fever. An examination from this standpoint of the foregoing tabular statement, or of the graphic chart, will more or less definitely substantiate this declaration. The truth of it becomes especially evident if, instead of recording the course of typhoid fever, as we have done by means of the Arabic numerals in the foregoing tabular form, we indicate each individual attack of typhoid

fever by a dot in the square corresponding to the proper date.

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

(a) We have obtained from this regiment requisite data for such a calculation from only one source, namely, as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever, and the development of the attack of typhoid fever. The Tenth Ohio furnished 12 cases of diarrhea preceding typhoid fever by intervals which could fairly be regarded as measuring a period of incubation of typhoid attacks. These 12 intervals averaged 12.7 days in length.

THIRD CONNECTICUT VOLUNTEER INFANTRY.

Second Brigade, First Division, Second Army Corps, Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. H. B. Thompson, surgeon.]

Niantic, Conn.—This regiment, responding to the second call for volunteers, assembled at Niantic, Conn., the State camping ground, on the 23d of June, 1898. It was mustered in by the 6th of July, and remained encamped at this place until the 8th of September. The water supply in the State encampment was drawn from wells about 30 feet deep. These wells were located as follows: A well for drinking purposes was placed at the top of the company street and another well, for cooking purposes, at the bottom of the company street near the kitchen. "We had this well water examined by the State chemist every once in a while, and he pronounced the water good, except from one well which was located at a kitchen, said not to be in use; but the men would drink there. After the chemist reported the water from this well as bad we took the handle from the pump." The latrines, located 100 or 150 feet to the rear of the kitchens, consisted of pits dug in the ground. The excrement in these pits was covered twice daily by a detail. Once a week or every ten days the contents would be dug out and buried, and a disinfectant, such as "Imperial hygiene fluid," would be thrown into the excavation to keep down the odor.

"We were so close to Niantic that at one time we had 169 absentees without permission. There were some cases of typhoid fever in the town of Niantic while we were there. The water supply of that place was from a lake 8 or 9 miles distant." Asked if there were shallow wells in Niantic, Major Thompson replied that they were not permitted to have a well in the town.

"A man was selling milk through the camp by the glass to everybody who would buy. We found that what he was selling was not fresh, and we stopped the sale. It was not learned where the man lived or the conditions surrounding the source of his supply. It is

to be remarked, however, that shortly after he stopped selling the milk the diarrheas lessened."

The First Connecticut Volunteer Infantry had been encamped on this ground and left it just as we arrived. When we left the State encampment they returned there. Our regiment had been upon the same camping ground vacated by the First Connecticut. The latter regiment had no typhoid fever while in the State encampment before they went to Camp Alger, Va., but they had much of it after they returned to the State encampment. "I understand they had sometimes 17 cases in one day after they returned to Niantic. I believe 17 cases developed the day after they got back there." Yet this was one of the least affected regiments at Camp Alger. It returned from Alger the first week in September, sending home in advance of their return 40 or 50 cases at one time.

The surgeon did not believe that any men of this command fell sick within two weeks of the assembling at Niantic. While in the camp there was a great deal of diarrhea with elevated temperature striking certain companies at different times.

The regiment was practically free from serious sickness while at this encampment until the first week in September. We had, however, 4 or 5 cases of typhoid fever during that time. This typhoid fever did not appear until just before the regiment left the State encampment, except 1 case developing about three weeks before moving—an isolated case. "We had only 4 or 5 cases of typhoid fever, and I think they came from different companies, every one of them."

Camp Meade, Pa.—When the regiment first came to Camp Meade, September 10, 1898, it was located on the lower ground between the canal and the line of the Pennsylvania Railroad. "We were there for a week, and I think we got our fever there, a form of malarial chills with fever. Most of the men got well in a week, with the use of quinine. A great many of them recovered under its use in two or three days. After remaining there for about a week we moved up on the higher ground. The constitution of the soil where we are now located is clay. Below the clay we strike gravel or stone which continues for about a foot. This gravel is sometimes right at the surface. It makes pretty hard digging. We dug battalion trenches for latrines 30 feet long, 10 feet deep, and 3 feet wide. As soon as the trench is filled to within 2 feet of the surface a new one is dug. We always have sentinels at the latrines and require every man to cover his own feces immediately.

"Filters have been issued to us (Pasteur, Berkefeld, or Maignen), but they are not worth a snap, except the galvanized iron one (the Maignen). The Pasteur or Berkefeld filters would not work, and we tried our best with them."

Since the arrival of the regiment at Camp Meade there have been about 24 fever cases of one kind or

another in hospital; they are not all typhoid. Some of these cases have been disposed of. At the present time the fever is diminishing. There is 1 case in the regiment now that is suspicious. (This testimony was taken about October 5.) The surgeon thought that Company I has had more cases than other companies have had. "This company was the one located next to that suspected well, though the men were forbidden to use the water from it."

Major Thompson was under the impression that the typhoid fever in his command was lessening. "It was during the first two weeks in this camp that we had the most of it. We call it 'undetermined' or 'suspected typhoid.' I think it is possible to have the two diseases (malaria and typhoid) running concurrently, and I believe we have had that concurrence, but as to there being a distinct disease, 'typho-malaria,' I do not believe it."

Major Thompson was of the opinion that the typhoid fever in his regiment originated from the suspected well at Niantic. He presumed that a great many of the men of Company I used that well water. They had another well, but this one was more convenient, and he thought they used the water from it principally to wash their dishes. "I tried to stop that, but the men would insist upon using the pump back of the kitchens for dish washing until we had the dishes washed with hot water."

ABSTRACTS OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE THIRD CONNECTICUT VOLUNTEER INFANTRY.

Camp Meade, Pa.—Capt. David Connor, commanding Company D, furnished a partial list of sick men of his company located in their tents, and stated substantially as follows: It is almost impossible to give a list of the men as they were located in tents, as we were moved twice while at Camp Meade, our first camp being beside a canal and on ground that had been occupied by other troops and been left by them in a very filthy condition. While on my tour of inspection as officer of the day, after getting settled, I found that the men were leaving their droppings on the side of this canal, and that they were also using the canal at the same time for bathing purposes. Both of these practices were immediately stopped as soon as discovered, and sinks were dug, which had not been done by the former body of troops (organization not stated). We soon after moved to another camp, which was in a hollow, but this second camp was kept clean. Sinks were made there and care was taken that they were used. In a short time we moved again to the top of a hill on rather higher ground, and at this latter place the camp was again provided with sinks and care taken of the health of the men. Fever broke out in other parts of the regiment quite severely. We boiled our water for drinking purposes and used all precautions.

The total number to be taken to the hospital was 6; my records do not show when they returned to the company after furlough, but I judge that they were absent sick from six to seven weeks. While other companies suffered a loss of men, my company did not lose any. The men were cautioned by me as to their manner of living, drinking, etc., and they were made to understand upon that depended their health.

The order of companies of the First Battalion, which was camped in the center of the regiment, is as follows: D, I, A, B, with Company B on the right.

This company was on detached service at Philadelphia to attend the peace jubilee parade, being absent from camp about two days (date not given).

The company was a mixture of rural and urban population, with intelligence about medium, conduct and habits fair, financial status on a par with the rest of the regiment.

We suffered less from general sickness and typhoid fever than any other company in our battalion. I endeavored, by earnest talks with the men, to show them how important it was that they refrain from all liquors and stagnant water, and to keep clean their persons, the company streets and quarters. I endeavored to have the bedding aired daily, and I was constantly on the alert. I attribute the good health of the company to the influence of all these causes.

Capt. William H. Hamilton, commanding Company F, furnished a list of men grouped in tents at Camp Meade, Pa., and stated substantially as follows: Company F was the third company of the Second Battalion. This company had the right of the line, and company letters were as follows: Band, C, E, F, G. We were camped in three places at Camp Meade; first near the State canal, next about 2 miles farther back on higher ground, and lastly on parade grounds on the highest elevation in Camp Meade.

Company F was not on detached service at any time as a company. Privates were detailed for detached service at brigade headquarters and at the brigade hospital at various times.

The greater proportion of my men came from factory villages; average intelligence medium; majority reasonably prudent as to personal conduct and cleanliness. About 20 out of the 104 men were inclined to drunkenness and recklessness. The financial status was fair and most of the men sent money home.

We had 27 cases of typhoid fever in my company and but 1 death. My company was the first in the regiment to suffer from the outbreak of fever. This was at the last camp. At one time we had 16 to 20 on the sick list. Men who reported on sick call were told that there was nothing the matter with them and were returned to active duty when in many cases they were unable to stand. In several cases we had men sick in quarters (in the same tents with well men) for two weeks before they were removed to division hospital. At the hospital they

were pronounced typhoid patients at once. Our second surgeon, Doctor Lee, was very kind and attentive to the men and did all in his power. I was obliged to complain to the colonel about leaving so many men sick in the company street, when the matter was promptly attended to. I visited division hospital every day personally until I was taken sick with typhoid fever myself. I went home and was confined to the house for fourteen weeks. I was very careful in camp regarding cleanliness as to kitchens, water barrels, disposition of kitchen slops, and covering of latrines, and constantly tried to impress the men with the importance of these matters. As to myself, I was extra careful in what I ate and drank. I would even cut off the outside of bread so as not to eat anything handled by the men. I drank very little water. I have no doubt there were hundreds of cases of walking typhoid in camp. I think I was walking around with it for three weeks before I was taken down. There were some cases of typhoid fever among the inhabitants of the town (Middletown, Pa.), but how much I can not say. Milk was bought very freely at one time by the men. The insides of the tents at night were black with flies. I never saw so many before or since.

My opinion is that the water of Camp Meade was the source of contagion; and that there was remissness in not taking temperatures and looking for the symptoms of typhoid fever, and that when those symptoms were found they were remiss in not getting the men promptly out of the company streets. One curious fact which impressed me was that those of my men who were taken sick were of the better class. The bums and drunkards had very little sickness.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORT.

July.—(Niantic, Conn.) Mean strength averaged for twenty-nine days: Officers, 35; enlisted men, 885; total, 920. Admitted from command, 21; by transfer, 1; otherwise, 10; total to account for, 32. Of 23 completed cases, 22 returned to duty, 1 was transferred. Remaining on sick report, 9.

Abstract of remarks by Maj. Julian La Pierre:

It will be seen by looking through this report that the prevailing disease is a grade of enteritis with dysenteric tendency, which readily yields to rest, restriction in diet, and proper medication.

It is not confined entirely to the camp, but prevails among civilians in the adjacent village of Niantic, making its appearance about the middle of July. Cause unknown, but supposed to be due to atmospheric conditions.

August.—(Niantic, Conn.) Mean strength of Third Connecticut not given. Sick report includes Batteries A and C of First Connecticut Artillery. Remaining on sick report from last month, 9; admitted from command, 38; total, 47. Of 42 completed cases, 39 returned to duty, 1 died, 2 were transferred. Remaining on sick report, 5.

There are no remarks on this report. It is signed by Julian La Pierre, major and surgeon, Third Connecticut Volunteer Infantry.

September.—The Third Connecticut Volunteer Infantry was removed from Niantic, Conn., September 10 to Camp Meade, Middletown, Pa. At Camp Meade from September 10 to September 30. The only thing stated in the indorsements of this report is that there are 40 completed cases. The report is signed by Hiram B. Thompson, surgeon, U. S. Army.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 44; enlisted men, 1,233; total, 1,277. Remaining on sick report from last month, 21; admitted from command, 142; total to account for, 163. Of 141 completed cases 35 returned to duty, 1 died, 87 were transferred to other hospitals, and 18 were otherwise disposed of. Remaining on sick report, 22.

Abstract of remarks by Harry M. Lee, first lieutenant and assistant surgeon:

Cases were sent to the division hospital as soon as they came under observation, so complete diagnosis can not be given. When patients were sent from division hospital exact location was not furnished. Prevailing diseases are typhoid and malarial fevers. The cause of typhoid can not be found. It is quite prevalent. As soon as a suspicious case is found it is transferred to the division hospital. Means of prevention are: First, the camp is kept in the best sanitary condition possible. The water is filtered, but not thoroughly, as we were never given a full complement of filters. Requisition has been made over two weeks ago, but the filters have never arrived. Bronchitis, in both a mild and severe form, also muscular rheumatism, prevails, but neither incapacitate many men. Gonorrhea is very common, and some few cases of syphilis are breaking out.

November.—(Camp Meade, Pa., and Camp Marion, Summerville, S. C.) Mean strength averaged for thirty days: Officers, 44; enlisted men, 1,042; total, 1,082. No further data given in indorsements.

Abstract of remarks by Harry M. Lee, first lieutenant and assistant surgeon:

Regiment located at Camp Meade, Pa., November 1 to 15; en-route to Camp Marion, S. C., November 15 to 17; Camp Marion, Summerville, S. C., November 17 to 30. Through the failure of the First Division Hospital at Camp Meade to notify us of the disposition of patients sent from there to city hospitals, we are unable to give the exact location of some of our cases.

December.—(Camp Marion, S. C.) Mean strength averaged for thirty-one days: Officers, 47; enlisted men, 1,183; total, 1,230. Completed cases, 33.

There is no other data furnished. The report is signed by Maj. Hiram B. Thompson, surgeon, Third Connecticut Volunteer Infantry.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE THIRD CONNECTICUT VOLUNTEER INFANTRY.

Brief outline of medical history.—In response to the second call for volunteers this regiment assembled at the State camping ground, Niantic, Conn., the 23d of June, 1898, and remained encamped there until the 8th

of September, when it started by rail for the national encampment at Camp Meade, near Middletown, Pa. The command arrived at Camp Meade on the 10th of September and for a week was located on "the lower ground" between the canal and the railroad, near the special railroad station for the camp, on ground occupied previously by other troops and left by them in a filthy condition. It was assigned to the Second Brigade, First Division of the Second Army Corps (while at Camp Meade), and about September 17 went into camp near the Two hundred and second New York—another member of the same brigade arriving direct from its State camp—on higher ground, but "in a hollow," changing again in a few days (date not given) to quite a high site having excellent natural drainage. (The colored battalion, Ninth Ohio Volunteer Infantry, the Fourteenth and Fifteenth Pennsylvania Volunteer Infantry, all formerly at Camp Alger, Va., were also attached for some time to the same brigade. See their histories under Camp Alger.) Here the Third Connecticut remained until the 15th of November, when it started by rail for Camp Marion, Summerville, S. C., arriving there on the 17th of that month. According to the regimental monthly sick report for December, 1898, the regiment was still at the latter place on the last day of the month.

Although this regiment was not mustered out of the service of the United States until March 20, 1899, at Savannah, Ga., its medical history by the board ends December 31, 1898. This medical account therefore covers a period of six months and seven days. Of this time seventy-seven days were spent in the State camp, sixty-six days in the national camp near Middletown, Pa., and forty-four days in the national camp near Summerville, S. C.

It is acknowledged by the surgeon in charge that this regiment suffered slightly from typhoid fever while yet in its State encampment near Niantic, Conn., and it is certainly true that the regiment carried the infection of typhoid fever with it to the national camp near Middletown, Pa. The regimental surgeon attributed the epidemic of typhoid fever experienced by this regiment while at Camp Meade to the infection acquired in the State camp. To this source of infection foreign to the national camp the board think it possible that further infection may have been added, picked up after arrival at the national camp while the regiment was located on polluted and insalubrious ground during its first week at Camp Meade. Typhoid fever ceased to prey upon the regiment after it moved to South Carolina on the 15th of November.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (typhoid included) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid

fever. In all cases the dates of the beginning of the attacks were recorded as closely as they could be ascertained.

[Third Connecticut Volunteer Infantry; mean strength, 1,214.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	All other.
July.....	12	.....	1	13	1	.....	.....	.....	.....	.....
August.....	10	.....	.....	10	4	.....	1	2	.....	1
September.....	13	.....	.....	13	6	2	3	21	26	.....
October.....	12	.....	3	15	16	11	8	81	100	.....
November.....	1	2	.....	3	1	1	5	28	34	5
December.....	.....	.....	.....	.....	1	.....	5	.....	5	.....
Total.....	48	2	4	54	29	14	22	132	168	13

The above tabulated deaths from disease by months were distributed among the companies as follows:

	Company.									Total.
	A.	C.	E.	F.	G.	H.	I.	K.	M.	
Typhoid.....	1	1	3	1	2	1	2	1	1	13
Other diseases.....					1					1
Total.....	1	1	3	1	3	1	2	1	1	14

The following is a series of three tables showing by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders, in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such other attacks.

Intestinal disorders in the Third Connecticut.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea.....	3	5	1	2	2	2	2	4	7	5	1	6	.....	40
Single long diarrhea.....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	2
Prolonged diarrhea.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	3
Total diarrhea.....	3	6	2	3	4	5	3	6	7	5	2	7	1	54

Totals include diarrhea in malaria and typhoid combinations.

Combinations of continued or malarial fever in the Third Connecticut.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	2	2	3	3	3	2	2	2	2	3	1	3	1	29
Long malaria (uncombined).....	.....	.....	.....	3	.....	.....	.....	2	1	3	1	1	2	13
Long malaria preceded by diarrhea.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Total short malaria.....	2	2	3	3	3	2	2	2	2	3	1	3	1	29
Total long malaria.....	.....	.....	.....	3	1	.....	.....	2	1	3	1	1	2	14

Totals include malaria in typhoid combinations.

Combinations of typhoid fever in the Third Connecticut.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	4	12	18	5	16	17	11	8	4	9	8	12	1	125
Probable typhoid (uncombined).....	3	1	3	.....	4	1	1	2	.....	1	1	2	.....	19
Typhoid beginning in diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1
Probable typhoid beginning in diarrhea.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Typhoid preceded by diarrhea.....	.....	.....	1	.....	1	1	1	1	.....	.....	1	.....	.....	6
Probable typhoid preceded by diarrhea.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2
Total certain typhoid.....	4	12	19	5	17	18	12	9	4	10	9	12	1	132
Total probable typhoid.....	3	1	4	.....	4	3	1	2	.....	1	1	2	.....	22
Total probable and certain typhoid.....	7	13	23	5	21	21	13	11	4	11	10	14	1	154

The records of sickness in this regiment were found to be more or less incomplete and to some extent conflicting. By way of illustration: We have found among the medical records, relating to the Third Connecticut, 12 cases of so-called short malaria, whose final disposition has not been indicated. How many of these were really typhoid fever and should have been added to the sum total of probable typhoid fever attacks given in the above summary table we had no means of estimating. Moreover, we have encountered 3 fatal cases of typhoid fever of which the only record of sickness found is the return made to the Adjutant-General's Office. The above tabular statement should, in our opinion, be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Third Connecticut Volunteer Infantry, as a member of the Second Brigade and First Division of the Second Army Corps, as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(*a*) The regiment was in its State camp, near Niantic, Conn., from June 23 to September 8; it was in the national camp, Camp Meade, Pa., from September 10 to November 15; it was in the national camp, near Summerville, S. C., from November 17 to December 31, 1898; it was mustered out at Savannah, Ga., March 20, 1899. The initial date of the first probable attack of typhoid fever was August 14; of the first certain attack of typhoid fever was August 22. It is certain that typhoid fever made its appearance in this regiment during the latter part of its stay in the State camp and that the regiment carried the infection with it to the national camp in Pennsylvania. It is possible that this infection was added to on the polluted and unhygienic camp site which the regiment temporarily occupied when it first reached Camp Meade, Pa. The medical history of the Third Connecticut, as given by the board,

covers a period of six months and seven days (from June 23 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 54; of so-called short malaria, etc., 29; of so-called long malaria, etc., 14; of probable typhoid fever, 22, and of certain typhoid fever, 132. Total attacks of probable typhoid fever (long malaria, etc., included), 168.

(c) Total deaths from typhoid fever, 13; total deaths from all diseases, 14; mortality per cent of total probable typhoid attacks, 7.73; of total certain attacks of typhoid fever, 9.84; per cent of typhoid deaths to all deaths by disease, 92.85.

(d) The mean strength was 1,214. The per cent of typhoid morbidity to mean strength, as to total probable typhoid fever attacks was 13.83, while the average for the brigade was 15.51; as to total certain typhoid attacks was 10.87, while the average for the brigade was 10.34. The number of typhoid deaths per 1,000 of mean strength was 10.70, while the average for the brigade was 10.25 and the average for the division was 12.55.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Third Connecticut:

Disease.	Individuals.	Average age.
Short intestinal disorders.....	37	23.7
Long intestinal disorders.....	1	22.0
Prolonged intestinal disorders.....	2	20.0
Total intestinal disorders.....	40	23.5
Short malaria, etc.....	23	24.9
Long malaria, etc.....	13	26.7
Probable and certain typhoid attacks.....	139	23.4
Total probable and certain typhoid and long malaria.....	152	23.6
Grand total of all above classes.....	215	23.7
Eleven soldiers who died of typhoid fever.....		25.1

For comparison of these average age figures with similar data relative to other regiments in this brigade and division we refer to the general tables relating to this subject at the end of the Second Army Corps at Camp Meade, Pa. (See also similar tables relating to the regiments of the Second Division of the Seventh Army Corps at Jacksonville, Fla.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) It is only when we study the course of sickness in the regimental organizations, as we have frequently said, from the standpoint of individual companies that we can

adequately appreciate the fact that the course of disease in the regiment is characterized by a series of company epidemics, each one having more or less perfectly its own individual characteristics. This is especially true when we regard the commencement, the exacerbations during the course, and the time of the termination of the company epidemics, and when thus regarded they are rarely seen to be synchronous. Not only are there variations in these company epidemics considered as integral parts of the regimental organizations, but there is, as a rule, no striking similarity in the course of the epidemics even in companies grouped together in battalion organizations. These dissimilarities in the course of company epidemics appear in the Third Connecticut to be on their face incompatible with the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means of propagation of these epidemics. Reference to the graphic chart and to the foregoing tabular statement gives ample evidence of this truth, and it is unnecessary to illustrate further by entering into details here. It appears that the arrangement of companies in the regimental camp at Camp Meade, Pa., in two battalions was as follows: In the First Battalion, which occupied the center of the regiment, Companies D, I, A, B, Company B being on the right; in the Second Battalion, Companies C, E, F, G; the order of the companies in the Third Battalion is not known.

(b) This regiment, as others, may be said to have had company epidemics of frequent greater or less exacerbations in their course, and the intervals between these exacerbations were, as a rule, closely coincident with the average period of incubation of typhoid fever. An examination from this standpoint of the foregoing tabular statement or of the graphic chart will more or less definitely substantiate this declaration. The truth of it becomes especially evident if, instead of recording the course of typhoid fever, as we have done, by means of the Arabic numerals in the tabular form, we indicate each individual attack of typhoid fever by a dot in the square corresponding to the proper date.

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

(a) The Third Connecticut furnishes 4 examples of attacks of diarrhea preceding typhoid fever by intervals which may be fairly regarded as measuring the period of incubation of typhoid fever. These 4 intervals average in length 10.2 days.

TWO HUNDRED AND SECOND NEW YORK VOLUNTEER INFANTRY.

Second Brigade, First Division, Second Army Corps.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. Daniel S. Burr, surgeon.]

Camp Black, near Hempstead, Long Island.—The regiment assembled at Buffalo, N. Y., and the battalions were sent down to Camp Black as fast as they were mustered. The first battalion arrived at Camp Black the middle of July; exact date not remembered. The whole regiment had assembled at Camp Black by the 4th of August. It was encamped near the Two hundred and first New York, adjoining it to the westward, the two regiments being separated about 100 yards. The slope of our land was away from the Two hundred and first, being to the westward. The slope of the Two hundred and first was to the eastward, and they got the drainage of the Two hundred and third.

The water supply of the camp was that of the general supply of Hempstead. There were no shallow wells in the encampment of this regiment. It was only when the men of this regiment visited other encampments that they may have used water from shallow wells or when they went to outpost duty. They may have used farmhouse wells, which, in the opinion of Major Burr, were worse than the shallow wells at Camp Black. In one of the companies which had the most fever the men had been going out to a certain well near the camp and drinking the water there because it was cool and palatable. This was L Company, on the left flank of the regiment.

The disposal of fecal matter was by means of company sinks, which were pits dug in the ground, the contents being covered lightly with dry earth two or three times a day. The sinks were distant at least 300 feet from the cook shacks. This regiment had no mess tents for the men, differing in this arrangement from the other regiments. The men of the companies went to the cook shacks to receive their food and ate their meals in the company streets.

(It may be inferred that the tents of the Two hundred and second New York were floored while at Camp Black, for Major Burr, when questioned concerning the existence of floors at Camp Meade, stated that they were floored there. "We brought our floors with us.")

Questioned as to the existence of typhoid fever in his regiment while at Camp Black, Major Burr replied: "I do not know. I do not know that they have had any genuine typhoid. I have not had the care of my men and could not say. We left 17 to 19 men in hospital upon quitting that camp. I could not say that any company of the regiment carried typhoid with them to Camp Black. It did not appear in any of the companies within two weeks of the time of their arrival in that camp. We began having cases of fever about

the 1st of September, but I could not say whether any of these cases have been diagnosed as typhoid since we left there. Four of these men have since rejoined us, and the hospital transcript forwarded with them showed 'malarial remittent fever' upon three of them." One man died of tetanus. Cases of fever at Camp Black seemed to be more numerous in two companies, while in Camp Meade they are more numerous in three other companies. At this point Major Burr referred to his assistant, Doctor Clinton, and to Major Wilcox, the attendant at the post hospital at Camp Black, for more definite information concerning the course of sickness in this regiment while at Camp Black.

Questioned as to his theory of the origin of typhoid fever at Camp Black, Major Burr said: "I have not formed any opinion, for I have nothing to base it upon. I understood that one of the post mortems at Camp Black showed ulceration of Peyer's patches. I also understood that the plasmodium (*malariae*) was found by microscopical examination."

The regiment started for Camp Meade, Pa., on the 13th of September.

Camp Meade, Pa.—The regiment arrived in this camp on the 14th of September.

The water supply at Camp Meade is furnished from the general elevated reservoir tank and distributed thence in iron pipes through the camp. Furthermore, the water is filtered in the camp by means of Pasteur and Berkefeld filters. There are six filters in the regiment, the Pasteurs being mounted on tripods, and a man being detailed to work each filter under the direction of one of the assistant surgeons. The filters are kept going pretty constantly during the day, and the men are ordered to drink the filtered water.

The same system of disposal of feces as prevails in the other regiments at Camp Meade is employed in the Two hundred and second—that is, dug pits and immediate individual covering of feces—and a sentinel is stationed at each company-sink.

The kitchen garbage is separated into solid and fluid, the latter buried in a pit and the former is burned in the crematory. Lime is also sprinkled in the pits, but it is not used daily.

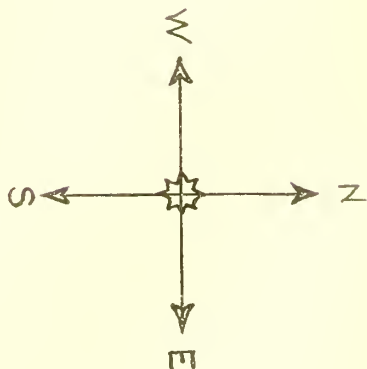
The tents are floored, as has been already stated.

Major Burr did not know whether he was having any typhoid fever, but stated that the fever cases which were occurring were more or less scattered. "I have 40 cases this morning [testimony taken about October 6], most of them fever. I think it is typho-malarial fever. No deaths have occurred among these men since our arrival here. We go over to the division hospital, but can not find them upon the records. We can not always find the records of admission or disposition of the men we have sent there. For instance, my orderly went over yesterday to make inquiry about a man we have in hospital. I got returns of three men sent to a Philadelphia hospital without the name of that

ROUGH PLOT of CAMP BLACK NEAR HEMPTSTEAD, LONG ISLAND.

HOSPITAL SINK

Post
 Hospital



LINE OF

SUPPLY

WATER

SUPPLY

PIPE

FROM

HEMPSTEAD

COMPANY SINKS

LINE OF

SUPPLY

RECUSES FOR

203rd

KITCHENS

LINE OF

SUPPLY

RECUSES FOR

203rd

KITCHENS

REGIMENTAL HEADQUARTERS

REGIMENTAL HEADQUARTERS

SUSPECTED SURFACE WELL (Low Ground)

GENERAL COMMISSARY QUARTERS

SURFACE WELL (LEVEL of CAMP)

202nd

201st

RECUSES FOR

203rd

BATTERY 5
 BATTERY 7
 BATTERY 4

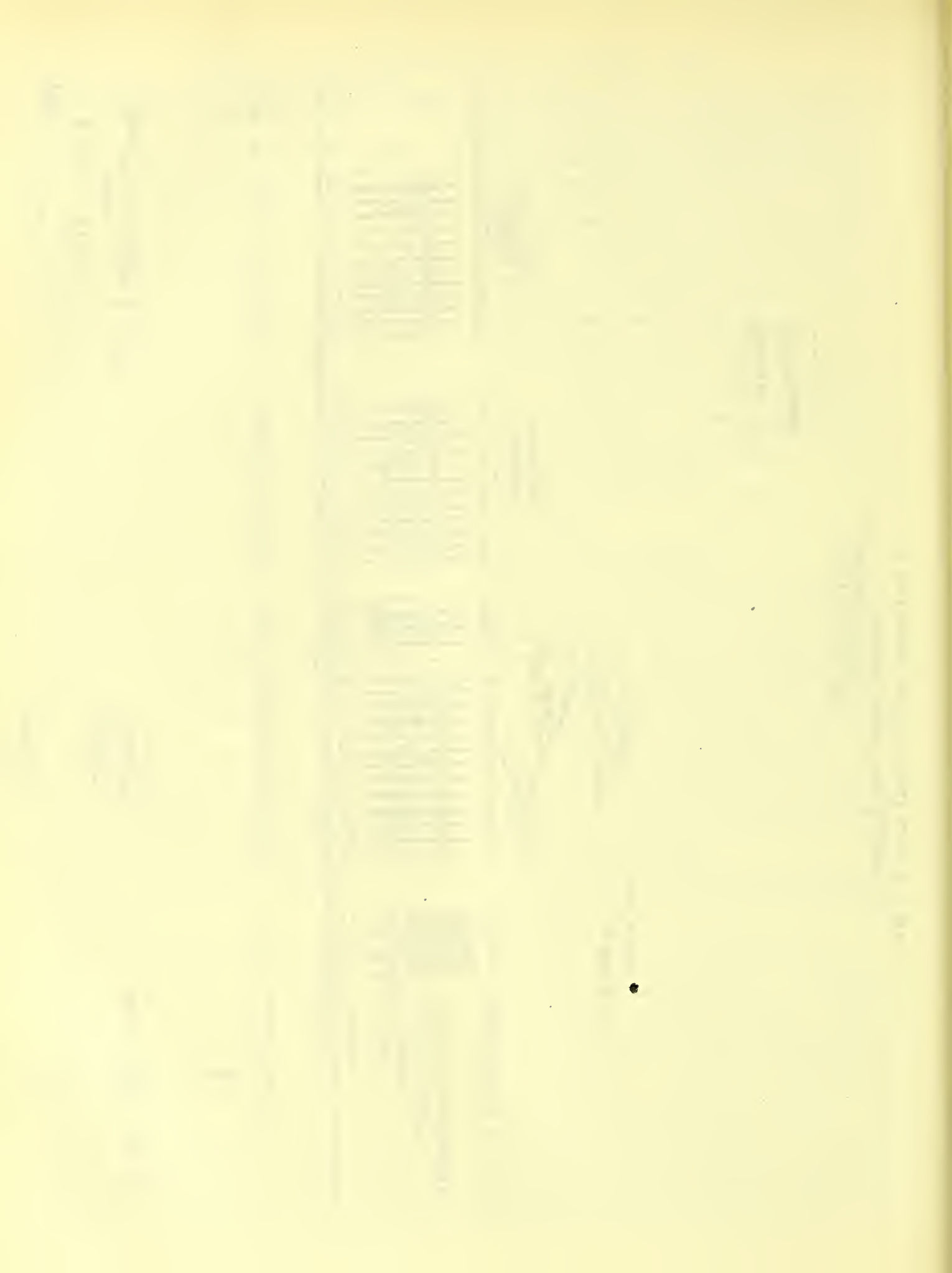
ARTILLERY 318 MEN LEFT 2 IN HOSPITAL. VERY LITTLE SICKNESS.

OFFICERS' TENTS.

GENERAL HEADQUARTERS

1/4 MILE FROM SUTLERS REGIMENTAL CAMP

VENDERS. COMMON TO ALL REGIMENTS. It had a shallow well & no closet within 300 feet.



hospital being given." Major Claude, surgeon of the First Maryland, here recounted numerous difficulties experienced in tracing the men in division hospital at Camp Meade.

Major Burr, resuming as to the character of fever among his men, said: "I have not seen a genuine case of intermittent fever—that is, chills, fever, and sweat—but we are having quite a number of fever cases. They are now, however, markedly decreasing. I am proceeding on the following plan—that of keeping a daily record of the temperature of my men who are feverish, using quinine in good doses. Watching the effect, I find many of these cases returning to a normal temperature. Those who can not retain the quinine show continuation of temperature and reach a point in three or four days where they require such nourishment as I can not give in quarters. I then send them to the hospital. But I believe that fully 50 per cent of these fevers yield readily to quinine."

The sick report to-day gives 55 in hospital and 63 in quarters. Company H seems to be leading. It has 11 in hospital and 11 in quarters.

[Lieut. W. Clinton, assistant surgeon.]

Camp Black, near Hempstead, Long Island.—The regiment was sent to Camp Black in three detachments, and Lieutenant Clinton arrived at the camp a week after the last detachment got there. He was on duty with the regiment at Camp Black from the first part of August until the 1st of September, at which latter date he went on duty at the post hospital there.

The soil of the locality is what is called "sour soil." It consists of a layer of peat $1\frac{1}{2}$ feet thick over sand and gravel. It has a flower growing upon it known as the "calf killer," which you do not find anywhere except in the neighborhood of swamps. The turf, after three weeks of hot sun, was so moist you could almost wring water from it as from a sponge, and after it was dry it burned like peat. The first stratum of sand and gravel just mentioned was about 18 feet thick; then came a layer of clay, and below another layer of sand, and again a layer of clay, and below that a third layer of sand. In the third layer of sand was excellent water. The depth of wells sunk into this third layer of sand was about 60 feet; on the contrary, the depth of the shallow wells was only about 18 feet. The latter was the depth of the wells dug for the troops which came here in May, the water from which some of our companies used, as did also some of the companies of the Two hundred and third New York. The surface of the ground is rolling. One of these wells was located by the side of a depression which would be a pond in rainy weather. After the men of the Two hundred and second New York located in camp a puddle formed just below this well whenever there would be a heavy rain; and the ground was usually more moist there than elsewhere. We had a very rainy summer, and the surface

of the ground being somewhat undulating the water in that pond consisted of the surface drainage from the neighboring camp sites. It should be understood, however, that at Camp Black the water scarcely runs down the sides of the hills, for the peat absorbs and retains it like a sponge.

Question by the board: "We have the evidence of the major surgeon concerning the encampment of the Two hundred and second New York at Camp Black. Can you give us any information concerning the outbreak of typhoid fever in that regiment?" Lieutenant Clinton replied substantially as follows: The men who were in the post hospital with typhoid fever from my regiment numbered about 12. I questioned them particularly about where they had been obtaining their drinking water. We had some shallow dug wells, about 18 or 20 feet deep, near the sites of the first-call regiments that had encamped in May all around that vicinity. The Seventy-first New York was one of those that had been encamped very near there. I inquired concerning the patients in the hospital from the Two hundred and third New York, and found that they had all been using water from the wells near them instead of from the taps. I think there were three of those superficial wells that were being used. Not all the troops, however, were using the water from these wells. Companies L and M of the Two hundred and second New York had been using these wells for drinking water, and they contributed all the typhoid-fever cases we left behind at the post hospital when the regiment moved to Camp Meade.

Searching for the source of initial infection in the Two hundred and second, he began with Companies L and M, because they were the ones closest to the Two hundred and third New York Regiment. Lieutenant Clinton did not know if the Two hundred and first Regiment had been using the same wells; but he was sure that the men of the Two hundred and third did use wells still closer to the sinks—the same kind of wells, but not the same identical wells. The well from which Companies L and M of the Two hundred and second had been filling their canteens was about 150 to 200 feet from the sink at regimental headquarters. Furthermore, in several places on that ground on a hot evening just at dusk you could smell an old buried sink, which we could not locate. We suspected that there were a number of buried old sinks, but we could not locate any of them. The seepage through that soil was particularly free and easy. We had extremely wet weather, followed by hot weather.

There is another well which may have some bearing upon the health of the companies on provost duty, which was located at a farm house half a mile from camp. This well, 18 feet deep, was within 20 feet of the open farmhouse privy. Upon inquiry, the farmer stated that the "old lady" had bowel trouble and was confined to bed for a period of six or seven weeks.

Some of the men had been using that water also until Lieutenant Clinton put a guard over it. All of the companies were from time to time upon outpost duty, but how many men had been at that farmhouse I do not know. It was not long, however, before this well was closed up and the men were prevented from using it.

As to the milk supply at Camp Black, of the two companies affected with the typhoid fever it may be stated that they got none except what the men bought themselves. Where they obtained their milk supply Lieutenant Clinton did not know. He had inquired of the physicians in the vicinity as to the prevalence of typhoid fever in the surrounding country, and had been informed that none existed, but that, on the contrary, there was more malarial fever than ever prevailed there.

Questioned as to his opinion concerning the cause of the outbreak of typhoid fever in the Two hundred and second New York at Camp Black, Lieutenant Clinton said: "It was due to the shallow wells and the flies. The camp was laid out by the sanitary engineer. The sinks were 50 yards away from the mess tents, and they were limed; but they were not very well cared for, and on a hot, moist day there was an offensive odor from them. No sentinel was placed at the sinks, and there was not a time when it would have been impossible for fresh fecal matter to be seen exposed there. Although the sinks were surrounded with burlap, there were always swarms of flies there. They were indeed fearful."

About the middle or latter part of August an outbreak of disease occurred in the Two hundred and third New York, from which organization over 100 men came into the post hospital within forty-eight hours. Our own men (from the Two hundred and second) came down in a bunch within a week of each other.

As far as I know there were only two companies of the Two hundred and second New York that sent typhoid fever patients to the hospital while at Camp Black. When the epidemic developed at Camp Black it was difficult for two weeks to know surely whether or not the men had typhoid fever. There was quite a large number of malarial cases at Camp Black, and they showed the malarial parasite in the blood. We also thought we could demonstrate the plasmodium in the red blood cells of some of the typhoid fever patients during the active stage in the second week of the fever. The Widal test was not applied in these cases, for we had not the means.

We collected some data from the cases at the hospital, because they were usually very atypical. The majority of the cases occurring at Camp Black during the first three days of the epidemic were characterized by a slow pulse, without any jaundice. The pulse did not correspond with the temperature. One man, for example, had a pulse of 46, while his temperature was over 100 in the morning.

Camp Meade, Pa.—Since arrival at Camp Meade almost every company has furnished fever cases. Lieutenant Clinton could not say how many cases of typhoid fever his regiment had furnished since coming to this camp. A large number of the sick are sent over to the division hospital before diagnosis is made. He sent one yesterday as a "typhoid suspect" from a company of the Third Battalion, to which Companies L and M belong, that furnished all the typhoid fever cases at Camp Black. Lieutenant Clinton, however, could not know if Company L or M was continuing to furnish cases of typhoid fever, for he had been detailed to look after the men sick in quarters.

The patients of the Two hundred and second New York are sent to the Second Division Hospital. One man has died of lockjaw, but none have died of typhoid fever. (This testimony was taken October 7.)

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE TWO HUNDRED AND SECOND NEW YORK VOLUNTEER INFANTRY.

Camp Black, near Hempstead, Long Island.—Capt. Frank S. Sidway, commanding Company C, furnished a list of men grouped in tents at Camps Black and Meade, respectively, and stated substantially as follows:

The regiment was sent to Camp Black by detachments. The arrangement of the company letters was A, C, D, B, and E. Companies F, G, and H came next, in that order. When the last battalion arrived the battalions were reorganized as follows: First Battalion, A, F, K, E; Second Battalion, B, G, M, D; Third Battalion, C, I, H, L. The battalions were ranged from right to left according to their number. This arrangement was continued at Camp Meade.

I was in command of a battalion of two companies, C and L, at Camp Meade that was sent to the corps bakery to relieve the battalion of two companies from the First Maryland. We were there from November 9 to 15, 1898. My company was one of the companies from the Two hundred and second New York that went to Philadelphia for the peace jubilee, and my company also occupied a post at Mariel, Cuba, from January 31 to February 10, 1899.

I think I had more men from the city in my company, although a number of them were from the country and small towns. The average intelligence was high, and they were reasonably prudent. A great many of them were out of work at the time they enlisted, but they all seemed to have considerable money. I think my company was about an average one as far as sickness was concerned.

Capt. Hamilton Ward, jr., commanding Company L, did not furnish a list of men in tents, but stated substantially as follows: In all encampments of the Two hundred and second New York the arrangement of the companies and battalions was as follows: From

right to left: First Battalion, A, F, K, E; Second Battalion, B, G, M, D; Third Battalion, C, I, H, L.

Company L was detached from the regiment only once. That was while the command was in Cuba.

About one-third of my company came from the city of Buffalo, and of the remaining two-thirds 90 per cent were from villages and small cities. The remainder were from farming places. The average intelligence was above the medium. I found that they gave the closest attention to all suggestions and matters affecting their health, and that, as a rule, such suggestions were obeyed and carried out. The men were careful as to their personal conduct. There were never more than three men absent from my company without leave at any one time. One-half of the men saved money from their pay, which they left with me or sent home. I believe that at least one-half of my men had allowances from some sources or an income from sources outside of the army. The greatest extravagances of the men were practiced after being mustered out.

My company was the first one in the regiment to be affected by typhoid fever, which I believe to have been due to the inexperience of my cook and the pooriness of the rations at Camp Black, the food being insufficient; and to the fact that my men were, as a rule, more accustomed to the luxuries of life than men in the other companies. I had 8 cases of typhoid fever at Camp Black. None died, and they all subsequently joined their company. There were no further cases of typhoid fever in my company during the entire period of its existence, although the remainder of the regiment was to some extent affected. So that, on the whole, I believe that I had slightly less typhoid fever than the average of the other companies.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty days: Officers, 43; enlisted men, 1,188; total, 1,231. Admitted from command, 326; total to account for, 326. Of 295 completed cases 191 returned to duty; 104 were transferred to other hospitals. Remaining on sick report, 31.

Abstract of remarks by Maj. Daniel G. Burr, surgeon:

This regiment has been on duty at Camp Meade, Pa., during the month of October, 1898. Detachments from the same are as follows: Second Battalion, comprising Companies B, D, C, and M, was on provost duty at Harrisburg, High Spire, and outlying districts from October 9 to 29, inclusive. Sick and wounded from these companies were removed to Harrisburg City Hospital.

A provisional battalion, composed of Companies C, F, I, and K, was sent to the peace jubilee parade at Philadelphia, October 25 to 28, inclusive.

At the present time both of the assistant surgeons are detailed away from the regiment.

November.—(Camp Meade, Pa., and Camp Haskell, Ga.) Mean strength averaged for thirty days: Officers, 43; enlisted men, 990; total, 1,033. Remaining from

last month, 33; admitted from command, 293; civilians, 2; total to account for, 326. Of 285 completed cases, 260 returned to duty; 4 were discharged; 19 were transferred to other hospitals; civilians disposed of, 2. Remaining on sick report, 0.

Abstract of remarks by Maj. Daniel G. Burr, surgeon:

Regiment on duty at Camp Meade, Pa., November 1 to 16. November 16 to 18, en route to Athens, Ga. November 18 to 20, at Camp Haskell, Athens, Ga.

From November 1 the regimental hospital has been maintained in operation without intermission. While en route to Athens a car, properly equipped, accompanied the last section of the train. The same hospital car was held at Athens until the hospital tents were erected at Camp Haskell.

On November 28 a detail of 1 hospital steward and 12 privates reported to me for duty at the regimental hospital.

December.—(Camp Haskell, Athens, Ga., and Habana, Cuba, and Camp Guanajay, Cuba.) Mean strength averaged for thirty-one days: Officers, 48; enlisted men, 1,143; total, 1,191. Remaining from last month, 43; admitted from command, 223; total to account for, 266. Of 195 completed cases, 1 died; 1 was discharged. Remaining on sick report in hospital, 22; in quarters, 46.

Abstract of remarks by Maj. Daniel G. Burr, surgeon:

The location of the camp during the month has been as follows: At Camp Haskell, Athens, Ga., from November 30 to December 3, 1898; from December 3 to 5, on train to Savannah, Ga.; December 5, embarked in United States transport *Minnewaska*, where it remained until December 9, at 8 a. m., entering the harbor of Habana, Cuba. December 9, 10, 11, and the morning of the 12th, on transport in Habana Harbor. On afternoon of December 12, the First and Third Battalions on train for Guanajay, and the Second Battalion on train for Pinar del Rio, the latter accompanied by Asst. Surg. James Wood, Acting Hospital Stewart Weir, and two privates Hospital Corps.

The regimental hospital remained with the First and Third Battalions at Camp Guanajay, Cuba, from December 12, 1898, to January 1, 1899.

Throughout the entire trip the regimental hospital has been in running order, with beds ready for the use of patients (excepting twelve hours, when unloading from transports on lighters). On each train a car properly equipped as a hospital was maintained.

At Camp Haskell, Athens, Ga., on the evening of the 30th (November), about 6 p. m., a private was shot with a pistol ball. Abdominal incision was made, with consent of consulting board, but too late to save the patient, he dying at 7 a. m., December 1, 1898.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE TWO HUNDRED AND SECOND NEW YORK VOLUNTEER INFANTRY.

Brief outline of the medical history.—This second-call regiment assembled at Buffalo, N. Y., and the battalions were sent to Camp Black, Long Island, as fast as they were mustered, the first battalion arriving there near the middle of July and the last one by the 4th of August, 1898. The regiment was located at Camp Black near and to the west of the Two hundred and first. (See general sketch map of Camp Black in August for relative position of second-call military

organizations in that camp.) In the outline history of the Two hundred and first New York brief mention is made of the first-call regiments which had been in this camp previous to its occupancy by the second-call organizations. The Two hundred and second New York remained in this State rendezvous until the 13th of September, when it proceeded to the national camp near Middletown, Pa. On the 14th of September this regiment reached Camp Meade, Pa., was assigned to the Second Brigade, First Division of the Second Army Corps, and went into camp with the Third Connecticut, the other member of this brigade which came direct from its State camp. (The colored battalion, Ninth Ohio and the Fourteenth and Fifteenth Pennsylvania, from Camp Alger, Va., were also for a time attached to this brigade. See their histories under Camp Alger.) The Two hundred and second New York remained in Camp Meade without change until the 16th of November, when it started by rail for Camp Haskell, near Athens, Ga., where it arrived on the 18th. The command remained in Camp Haskell until the 3d of December, when it took train for Savannah, Ga., reaching there on the 5th, when it embarked on the transport *Minnewaska* and sailed for Habana, Cuba. The transport arrived in the harbor of the latter city on the 9th, but the regiment remained on board until the 12th, on which latter date the First and Third Battalions went by rail to Guanajay, and the Second Battalion also went by rail to Pinar del Rio, Cuba. These battalions were at the same points respectively on the 31st of December, 1898. The regiment was mustered out of the service of the United States April 15, 1899, at Savannah, Ga.

The medical history of this regiment, as prepared by the board, covers a period of five months and fifteen days. Of this time fifty-nine days were spent at the State camp, Camp Black, Long Island; sixty-three days at the national camp in Pennsylvania; fifteen days in Camp Haskell, near Athens, Ga.; two days en route to Savannah, Ga.; seven days on transport en route for Habana, Cuba, and in that harbor; nineteen days at Guanajay and Pinar del Rio, Cuba.

The Two hundred and second New York began to suffer from typhoid fever by the end of August, and before it left Camp Black for the national camp in Pennsylvania was already pretty extensively infected. The number of attacks developed after its arrival at Camp Meade, Pa., increased until the expiration of the average period of incubation after reaching the national camp, and then began a gradual decrease—at first slow, later more rapid—until at the commencement of the last ten days in Camp Meade the epidemic had almost ceased to exist. A few scattering attacks of typhoid fever continued to occur, however, after the regiment

moved south, and in the last nine days of the month of December, 1898, there was a slight recrudescence.

As to the origin of the infection of the Two hundred and second New York we would, in addition to calling attention to the remarks of medical officers of the regiment upon that subject, refer to our remarks concerning the Two hundred and first New York relative to the histories of certain first-call regiments which had previously left Camp Black for the national encampments, carrying with them the infection of typhoid fever.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained:

[Two hundred and second New York Volunteer Infantry; mean strength, 1,125.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	Deaths from disease.
July.....	11	1	.....	12	1	.....	.....	2	3	.....
August.....	40	1	2	43	37	1	.....	.....	.....	.....
September.....	15	.....	.....	15	59	23	23	62	108	1
October.....	9	2	.....	11	69	11	13	35	59	7
November.....	13	4	.....	17	48	6	2	8	16	1
December.....	26	11	5	42	15	5	2	3	10	.....
Total.....	114	19	7	140	229	46	40	110	196	10

α One typhoid death in January, 1899, included in above total of 10.

A rectification of the total number of so-called long malaria, as given in the above summary table, should be made by reducing the total of 46 to 45, thus requiring a corresponding reduction of the number of total probable typhoid attacks from 196 to 195.

The above tabulated deaths from disease, by months, were distributed among the companies as follows:

	Company.							Total.
	A.	C.	F.	H.	I.	K.	M.	
Typhoid.....	2	2	.....	1	1	3	1	10
Other diseases.....	.....	.....	1	.....	.....	.....	.....	1
Total.....	2	2	1	1	1	3	1	11

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (α) who have had no other recorded attacks

(of the categories we have been considering) and (b) who have had such other attacks.

Intestinal disorders in the Two hundred and second New York.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea...	6	6	3	7	11	9	6	6	6	5	3	5	4	77
Two attacks short diarrhea...														
Short and prolonged diarrhea...			1		2	1							1	5
Single long diarrhea...	1	1		1	1				2	1	1			8
Single prolonged diarrhea...										2		1		3
Prolonged and long diarrhea...									1					1
Total diarrhea...	11	9	8	13	20	16	11	6	15	9	9	7	6	140

Totals include diarrhea in malaria and typhoid combinations.

Combinations of continued or malarial fever in the Two hundred and second New York.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined)...	17	11	9	14	11	11	10	12	14	7	16	15	5	152
Short malaria preceded by diarrhea...		1	1	1			3			1	1	1		9
Short malaria followed by diarrhea...	2			1	2				3		1		1	10
Short malaria preceded and followed by diarrhea...									1					1
Two attacks short malaria...	4	2	1					3		1	3	1	1	16
Short and long malaria...										1	1			2
Long followed by diarrhea...	1								1					2
Long malaria (uncombined)...	3	1	5	1	2	1	3	11	3	2	3	1	1	37
Long malaria preceded by diarrhea...										1				1
Long and short malaria...										1	1			3
Total short malaria...	30	17	12	17	15	12	16	20	19	16	28	19	8	229
Total long malaria...	6	1	5	1	2	1	3	11	4	4	6	1	1	46

Totals include malaria in combination with typhoid.

Combinations of typhoid fever in the Two hundred and second New York.

Disease.	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined)...	10	6	9	2	9	1	12	15	5	9	5	2	1	86
Probable typhoid (uncombined)...	3	4	2	2	4	3	3	2	3	1	5	2	1	35
Typhoid, preceded by diarrhea...			2	1	1	1	2							7
Probable typhoid, preceded by diarrhea...			1											1
Typhoid, followed by diarrhea...	1			1	1	1					2			6
Typhoid, preceded by malaria...		1			2		1	1			1	1		7
Probable typhoid, preceded by malaria...							2			1				3
Typhoid, followed by malaria...	1							1						2
Probable typhoid, followed by malaria...											1			1
Combinations of three diseases...				1		1								2
Total certain typhoid...	12	7	11	5	13	4	15	17	5	9	8	3	1	110
Total probable typhoid...	3	5	2	2	4	3	5	2	3	2	6	2	1	40
Total probable and certain typhoid...	15	12	13	7	17	7	20	19	8	11	14	5	2	150

The records of sickness in this regiment were found to be very incomplete and to some extent conflicting. By way of illustration: We have not been able to find

sick reports from this regiment earlier than October, although it assembled and began muster in as early as the 20th of July. Furthermore, there are 38 cases of so-called short malaria, the ending of which is not indicated in the records. How many of these were really typhoid fever and should have been added to the total number of probable typhoid attacks shown in the above summary table it was impossible for us to estimate. Moreover, there were 2 fatal cases of typhoid fever recorded in the adjutant-general's office of which there has been no other sick record found. The above tabular statement of sickness should, in our opinion, be regarded as an underestimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Two hundred and second New York Volunteer Infantry as a member of the Second Brigade and First Division of the Second Army Corps, as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(a) The regiment was in Camp Black, the State camp, near Hempstead, Long Island, from July 20 to September 13; it was in the national camp, Camp Meade, Pa., from September 14 to November 16; it was in the national camp near Athens, Ga., from the 18th of November to the 3d of December, when it left by rail for Savannah, Ga.; it was on board the transport *Minnewaska* from the 5th to the 12th of December, three days of which time it was in the harbor of Habana, Cuba; it was in Guanajay and Pinar del Rio, Cuba, from the 12th to the 31st of December, 1898, and it was mustered out on the 15th of April, 1899, in Savannah, Ga. The initial date of the first probable attack of typhoid fever was August 30 and of the first certain attack of typhoid fever August 28. An epidemic of typhoid fever started in this regiment during the latter part of its stay at Camp Black and was in full progress when it moved to the national camp, Camp Meade, Pa.; and it reached its height in the latter camp soon after its arrival there. The medical history as given by the board covers a period of five months and fifteen days (from July 20 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 140; of so-called short malaria, etc., 229; of so-called long malaria, etc., 45; of probable typhoid fever, 40, and of certain typhoid fever, 110. Total attacks of probable typhoid fever (long malaria, etc., included), 195.

(c) Total deaths from typhoid fever, 10; total deaths from all diseases, 11; mortality per cent of total probable typhoid fever attacks, 5.12; of total certain typhoid attacks, 9.09; per cent of typhoid deaths to total deaths by disease, 90.90.

(d) The mean strength was 1,125. The per cent of typhoid morbidity to mean strength as to total probable typhoid attacks was 17.33, while the average for the brigade was 15.51; as to total certain typhoid attacks it was 9.77, while the average for the brigade was 10.34. The number of typhoid deaths per 1,000 of mean strength was 8.88, while the average for the brigade was 10.25 and the average for the division was 12.55.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever; and we have obtained the following figures as to the Two hundred and second New York:

Disease.	Individuals.	Average age.
Short intestinal disorders	26	23.9
Long intestinal disorders	3	23.0
Prolonged intestinal disorders	4	27.2
Total intestinal disorders	33	24.5
Short malaria, etc.	72	23.7
Long malaria, etc.	13	24.7
Probable and certain typhoid attacks	34	23.6
Total certain and probable typhoid and long malaria	47	23.9
Grand total of all above classes	152	23.9
One soldier who died of typhoid fever		20.0

For comparison of these average-age figures with similar data relative to other regiments in this brigade and division, we refer to the general tables treating of this subject at the end of the Second Army Corps, at Camp Meade, Pa. (See also similar tables relating to the regiments of the Second Division of the Seventh Army Corps, at Jacksonville, Fla.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) The dissimilarities in the course of company epidemics appear in the Two hundred and second New York to be on their face incompatible with the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means of propagation of these epidemics. Reference to the graphic chart and to the foregoing tabular statement gives ample evidence of this truth, and it is unnecessary to illustrate further by entering into details here. It appears that the arrangement of companies at the State camp at Camp Black was from right to left, as follows: First Battalion, A, F, K, E; Second Battalion, B, G, M, D; Third Battalion, C, I, H, L. The arrangement of the companies in the regimental camp at Camp Meade seems to have been the same as above.

(b) These company epidemics have frequent greater or less exacerbations in their course; and the intervals between these exacerbations are, as a rule, closely coincident with the average period of incubation of typhoid fever. An examination from this standpoint of the foregoing tabular statement or of the graphic chart will more or less definitely substantiate this declaration.

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

This regiment furnishes only one instance of diarrhea preceding the development of typhoid fever by an interval which may be fairly regarded as measuring a period of incubation. In this case the interval was twelve days.

FIFTEENTH MINNESOTA VOLUNTEER INFANTRY.

Third Brigade, First Division, Second Army Corps,
Camp Meade, Pa.

ABSTRACT OF SURGEON'S TESTIMONY BEFORE THE BOARD.

[Maj. W. A. Dennis, surgeon.]

Camp Ramsey, near St. Paul and Minneapolis, Minn.—This testimony was taken October 5, 1898. This regiment came in response to the second call, the first companies assembling at Camp Ramsey, within the State Fair Grounds, near St. Paul and Minneapolis, Minn., on the 5th of July. The regiment was in this camp from the 5th of July to the 23d of August. While in that encampment the regiment changed grounds once, eight companies thereof being removed on the 15th of August 80 rods from their first location. On the 23d of August the regiment moved to Fort Snelling, Minn. (only a few miles distant from the former encampment), where they went into camp and remained until the 15th of September, when they started for Camp Meade, Pa.

The water supply at Camp Ramsey was as follows: During the first ten days we had water from a well near the stables. That water became somewhat cloudy, and we abandoned it.

There are three wells within the fair grounds; one is near the highest point on the knoll and has a windmill. The latter well supplies the tank on the highest ground and the tank at the stables. The well at the secretary's house was not furnished with a windmill, but it was not used by our men until the water from the well at the stable got cloudy, as already stated. We then had the tank near the secretary's house cleaned, and had a steam pump installed there for driving the water. The whole grounds were supplied from the well near the secretary's house by means of the engine. The well here was a driven well 165 feet deep. The whole regiment was then supplied exclusively with water from that source. The various tanks upon the grounds for the distribution of water, the secretary said, had been cleaned out every season.

There is a barn opposite the secretary's house, and there is a surface well with a pump attached for the supply of the cattle during the winter season, when, for any reason, the regular water pipes may have been frozen. We never discovered that our men used the water from this surface well near the barn until the last two or three days of our stay in Camp Ramsey.

The method of furnishing water to the companies was as follows: There was a closed water wagon, which was filled at a crooked standpipe near the tank by means of a hose hanging from the standpipe. After being filled with water the wagon drove to the camp, and then went along the line of company kitchens and filled their water barrels, of which each company had two, through a hose attached to the wagon. These water barrels were not at first covered, up to the time of the outbreak of typhoid fever. This statement applies to all of the companies. I presume the wagon went around twice a day, for it was kept pretty busy.

There was one man, an engineer, working the engine which pumped our water supply into the tank. He remained well, and he did not have a family there. There was no sickness in the secretary's family, near which the well was located which supplied our camp, and the secretary declared to us, in speaking of the outbreak, that he had never experienced any trouble of that sort. There had been none among any of his employees.

In addition to the distribution of the general water supply, as already mentioned, it should be stated that there are hydrants throughout the fair grounds supplied from the same source, and the men drank from them. All the wells supplying the tanks for storage and distribution are driven wells, generally worked by a windmill.

There was no regular milk supply. The only milk the men had was what they purchased at the refreshment shacks, which were opened in the fair grounds, and what was got in the hospitals after they became sick. The companies that first became sick with typhoid fever were not believed to have more frequently patronized the shacks which sold pies and milk than did the men from other companies. The men did not consume much milk and the surgeon felt safe in saying that previous to the outbreak of typhoid fever the men in the companies chiefly affected had practically used no milk at all.

At the time of the outbreak we had no officers' mess. Part of the officers messed at a restaurant on the ground and part at a hotel.

Our regiment was located upon high ground to the north of the secretary's house and about 60 rods from the latter. The ground was good for a camp site. It was high and sloped in two directions: to the south toward the secretary's house and to the west toward the race track.

The identical ground upon which we were encamped at the State fair grounds at Camp Ramsey was occupied during the first call by the Twelfth Minnesota. In digging our kitchen sinks we were compelled in some cases to enter their old kitchen sinks. Our slop sinks at the kitchens were in about the same location as theirs—not the latrines. Occasionally in digging our kitchen sinks we would knock a corner out of their

old ones, but we would not know the location of theirs until we had got into them. Questioned as to whether the Twelfth Minnesota had suffered from typhoid fever, Major Dennis replied: "I wrote them at Chickamauga and they stated that they had no typhoid and had had none for thirty days after their arrival at Chickamauga, but the newspapers of the period give the names of persons in the regiment having typhoid, and we wrote them for maps. Three regiments were called out first. The Thirteenth commenced to have typhoid on the way to San Francisco, and they had some typhoid fever since. But the newspapers may have been mistaken. They were on the State fair grounds, but not upon the same site as our command, and they used the same water. The Twelfth Minnesota was upon this ground from about the 27th of April until the 21st of May. There were two or three regiments encamped in the fair grounds which occupied the barns. They were here at the same time as the Twelfth. The Twelfth, Thirteenth, and Fourteenth were using the same water supply. All three of these regiments went to Chickamauga." Major Dennis did not learn if the Fourteenth had typhoid. The Thirteenth was on the grounds about nineteen days and on a different camp site. We were the only regiment occupying the grounds at the time we were there; the other three had been gone some time. The Twelfth were, as already stated, on the same ground that we were. The Fourteenth was housed in the stock barns.

The Fifteenth Minnesota had one regimental sink or latrine which was located to the northwest of the camp on ground which was lower than the latter and drained away from it. On the 10th of August Major Dennis recommended to the commanding officer that every man visiting the latrine be required to cover his own excrement, but this was not rigidly carried out.

Major Dennis stated the history of the health of the camp substantially as follows: At the start our troubles were chiefly diarrhea; that was practically all we had until the 4th or 5th of August. About that date we had quite a number of men overcome with the heat, the weather being very hot. I remember on the first day probably eight or ten men fell out of the ranks, some fainting, some falling out. It was excessively hot and the men were not used to such severe exercise. This was in the latter part of July and in the first part of August. Along early in August we got into our regimental hospital a number of suspicious cases. We did not think at the time that they were typhoid—men who came in with high temperatures. We had quite a lot of diarrhea in August. Quoting from his register, Major Dennis continued: The first case is recorded on August 3, the date the man was taken sick, although the diagnosis was not made at that time. This man was from Company F. Requested to read off the first 10 or 12 cases from his records, Major Dennis read as follows: Private, F, August 3; another private of Company F on the

same date; 2 privates of Company H on August 4; 1 of Company K, August 4; 1 of Company A, August 4; 2 of Company F, August 5; 1 of Company K, August 5; 1 of Company D, August 5; 1 of Company M, August 5; 1 each of Companies F, L, and M, August 6; 2 of Company K, August 6; 1 of Company E, August 7; 1 of Company K, August 7; 1 each of Companies H and K, August 8; 2 of Company M, August 8; 4 of Company F, August 9; 3 of Company H, August 9; 1 of Company K, August 9; 1 of Company B, August 10. Summary of the foregoing is as follows: A, 1; B, 1; C, none; D, 1; E, 1; F, 9; G, none; H, 7; I, none; K, 7; L, 3, and M, 4.

At the start typhoid fever was limited to a few companies of the command, while the others practically escaped the disease. The companies most affected in the beginning were F, H, K, and M. The affected companies, as far as known, used the same water supply as did those which were very little affected. Another remarkable circumstance is that the affected companies were separated from each other by other companies not particularly affected. The regiment was here nearly a month before this outbreak; that is, from the 5th of July to the 3d of August.

Two of the affected companies were from the country and one from the city, and half of another company was from the city. Major Dennis did not know any difference between the social status and ability to spend money between the companies affected and those not affected. Probably Company K possessed some men that were a little better circumstanced than the others. Questioned as to whether there were any circumstances connected with the health of the men in camp which might suggest a cause of the outbreak of the disease in these particular companies, Major Dennis replied: The only thing I could see that pointed in that direction was a hard rain that we had on the 5th of August; a very severe storm. They may have been infected at that time, for after that rain they came to sick call rapidly, more so than they did before. Two of these companies got very wet—Company F and Company K. A great many of their tents were on lower ground, but those that had wet tents did not sleep in them that night. We put the men in one of the buildings at the fair grounds. As had been already remarked, the men throughout the regiment were sleeping on the ground, and the tents were not floored. A marked increase in sickness came two or three days after that storm. We were congratulating ourselves upon having escaped pneumonia and bronchitis from the storm, but we hardly expected typhoid at that time. It is true that some of the sickness began before the occurrence of the storm. The increase just mentioned mainly came from the four affected companies.

The site of the camp at the fair grounds is almost midway between the cities of St. Paul and Minneapolis, and they are 10 miles apart. This camp was a mile and

a half aside from the direct line. The access to these cities from the camp was easy. Company K came from Minneapolis, and about one-half of Company M were from South Minneapolis. Practically none of these companies were from St. Paul. Major Dennis thought that the very first cases were in Companies F and H, which were from the country. But very soon there was practically no difference in the rapidity of development of the fever among these four companies.

It is not thought that a man in the regiment had been furloughed at that time. For this reason Major Dennis had at first believed that it was chiefly the city companies to which the men belonged who were able to visit their homes. But it must be remarked that the other men were able to go to St. Paul and Minneapolis. Bearing upon this fact, Major Dennis stated that there were quite a number of men taken with typhoid fever who had never been in either city, even among those first attacked. Furthermore, it may be presumed that the men rambled around the country and visited neighboring farmhouses. As to this point of view the health officer did not know of any typhoid fever having been in the neighborhood. Major Dennis felt perfectly safe in saying that the men of these first affected companies were probably not being supplied at all with milk from the outside.

There is a good deal of typhoid at certain times in the city of Minneapolis. The water supply of that city is from the Mississippi. There are two intakes from which the water is pumped to a reservoir northwest of the town. One of these intakes is above the city; the other within the city limits. Although Major Dennis did not belong to Minneapolis and was not familiar with the details of the sanitary surroundings of that city, he thought the sewers flowing through the northern part of Minneapolis emptied into the river above the point of the second intake. He could not, however, say whether the city waterworks were pumping from the lower intake previous to the time of the outbreak in the camp. At this time typhoid fever was not epidemic in the city of Minneapolis, but they have the disease there the whole year round.

Questioned as to what he attributed the outbreak of fever in the command, particularly its coincidence in the four companies above named, Major Dennis replied: "I am not clearly settled as to what to attribute it, but am very much inclined to think it was the water." Asked by a member of the board, "How do you account for the brunt of the disease falling upon these four companies while the others practically escaped, although they were using the same water?" Major Dennis said: "I think it might be accounted for in this way. Suppose, at the time in question, the water may have gotten low in the supply tank at the secretary's house, and, say, at that time the tank wagon is filled, and going along the company kitchens finds certain companies have water and certain companies have not. If at that time the level

of the water in the tank were near the bottom, the water would be apt to contain more organic matter and bacteria per gallon than if the level were nearer to the top of the tank." (Major Dennis meant to suggest, of course, that in such a manner it might be possible for certain companies to receive at a given time a far heavier dose of typhoid infection from a general water supply than the other companies received customarily, and thereby become prostrated seriously, while the others suffer far less severely, or perhaps not at all at the time, not having imbibed a full operative dose.)

As to investigations of the water supply at Camp Ramsey: As soon as the first outbreak of fever occurred specimens of water were taken for examination, probably about the 8th of August. "We were very loath to believe these cases were typhoid, and I had my business associate, Doctor Wheaton, come and look at them. They had temperatures of 103° or 104°, tongues white, and every one of them hungry and clamorous for food. Doctor Wheaton pronounced these cases typhoid, and I commenced making the Widal and Diazo tests. These tests were made up to the 13th of August. About that time I took a specimen of ice and water from the barrels of Company II. These specimens were placed in sterilized bottles and sent to the city health office (St. Paul). No typhoid bacilli were found. It was contaminated water. I believe the colon bacillus was found."

The original specimens of water taken about the 10th or 12th of August from the distributing tanks, from the tank wagon, from the water barrels of the companies, from the well near the stables marked "B," and from the ice, were handed to Dr. Arthur W. Miller, bacteriologist of the health department of the city of St. Paul, Minn., for examination. The water from the tank wagon was the only one that gave a culture of typhoid bacillus. The bacilli obtained from this culture were subjected to the Widal test, and he got the reaction. The water subjected to examination by the State board of health was obtained later. The specimens examined by Doctor Miller were the first ones taken.

The man who had the tank wagon stated that he had only used it for filling cisterns, and said that no other water had been used in this tank wagon besides that of the tanks near the secretary's house, except water from the St. Paul city supply. Water from the Minneapolis city supply had never been used in the tank wagon.

After the outbreak most of the water was boiled, but whether the men drank the boiled water exclusively or not Major Dennis could not say.

Major Dennis stated that the opinion he had finally arrived at was that it must have been water infection. Earth infection is rare. He could not, however, exclude dust infection. The dust had not been very bad, except one day, when there were great clouds of it from the west, and at this time he did not think the water barrels of the companies were covered.

Questioned as to how the cooking was done in the

infected companies, Major Dennis stated that the cooks were enlisted men detailed for the purpose, just as they are at the present time, most of the cooks now being the same men that were serving in that capacity at the time of the outbreak. The cook in Company K was among the first taken sick; he became ill on August 7.

No measures were taken as regards disinfection of tents; we have the same tentage now as at first. As to the bedding, we practically have none. Our blankets were disinfected as fast as the men were taken sick; disinfected with a solution of bichloride of mercury, 1:500. And we endeavored to disinfect all the clothes, obtaining the use of a small building for that purpose, in which there was installed a formaldehyde generator. Finding that most of the men had no underwear, we put them into the commissary building and gave them a cleansing bath, followed by a bichloride bath, attempting also to work the formaldehyde; but this was not successful, as it took too long.

No other regiment had been using our regimental latrine; we dug it ourselves. At first, however, a permanent latrine in one of the buildings upon the fair grounds was used. The regimental latrine, dug for the purpose, was not disinfected at the commencement, but the practice was to cover the material in it once a day. We had been pestered with flies.

Major Dennis could not remember any unusual event taking place in the camp ten days or two weeks before this outbreak of typhoid fever. There had been no visiting crowds from anywhere by excursion trains except on Sundays. Of course there were some visitors during the week, but there were no big excursions. None of the affected companies had been out on patrol duty.

After a diligent search of the records, the surgeon had been unable to find an earlier case than that mentioned above. As far as he could learn, no man had arrived at camp with his company sick, and there had been no suspicious cases sent away. There was a man who was home on leave of absence that was taken sick earlier, but he became ill while at home, and his case developed into typhoid fever. He was a Minneapolis man, but he did not become ill until shortly after going home. He did not think the man felt sick at all while in camp. He could not remember the man's name, but his father was superintendent of the Washington Home at Minneapolis.

At first, as has been stated, the disease most severely affected these four companies. On the 15th of August the eight unaffected companies were moved from the first site of the camp to a new site, distant 100 rods from the first camp and near the secretary's house. At the same time the four affected companies were transferred from their original location to new ground in their immediate vicinity.

The original disproportion in the number of typhoid-fever cases developing in the four companies did not

continue after this removal, for there were a great many more cases from the eight companies, which were at first comparatively free from the disease, than from the four companies first affected.

Questioned as to the largest number of cases furnished by any one company, Major Dennis stated that there had been 60 out of a strength of 106—that is to say, between 50 and 60 out of one company—sent to hospital. But all these cases did not prove to be typhoid. “I remember one day we sent a lot, and in a few days thereafter we had four or five of them back. I think not over 10 per cent failed to be typhoid.”

The eight companies originally comparatively free from disease—those removed to the new camp site 100 rods distant from the old camp—began to come down with typhoid fever about the 18th of August with scattering cases, Company L furnishing the most. Up to the 23d of August, when the regiment left Camp Ramsey and marched to Camp Snelling, Company L furnished more cases than did any other. At the time of marching the regiment from Camp Ramsey to Fort Snelling Company G was left behind for one day to police the old camp sites. Up to that time this company had practically no typhoid fever. Soon after rejoining the regiment at Fort Snelling that company sent seven to eight men to the hospital per day for a while.

Questioned as to whether all the companies had quite a large number of cases before the end of August, Major Dennis stated that Company C had not. They have had a few cases since arriving at Camp Meade. They have not had more than 20 cases, all told, and a good many of these have been recent developments. Up to the time they arrived at Camp Meade there were not over 11 cases among them, a lieutenant being the eleventh. As has already been stated, this company suffered less than any of the companies.

Major Dennis stated that something over 400 cases of typhoid out of a strength of 1,300 had occurred up to the time of leaving Fort Snelling. All of these cases, however, were not unmistakably typhoid. Some of those men who went to hospitals did not subsequently appear to have typhoid fever, and some of them we have never received an account of.

Camp Meade, Pa.—The regiment arrived at Camp Meade, Pa., on the 19th of September. On the first day after going into camp there 14 cases were sent to hospital, the next day 9, and the next day 13, some of the 13 being malaria. The total number of cases which have developed since the arrival of the regiment at Camp Meade are as follows: On September 19, 14 cases; September 20, 9 cases; September 21, 12 cases; September 22, 13 cases; September 23, 6 cases; September 24, 1 case; September 25, none; September 26, 1 case; September 27, none; September 28, 3 cases; September 29, 2 cases; September 30, 1 case. This makes a total

of 62 cases. Questioned as to whether he believed all these cases to be typhoid fever, Major Dennis replied that he did not. He then handed to the board an abstract of a report which he had made to the corps commander, giving an analysis of these cases. This abstract is as follows: “Of the 62 cases sent from this regiment during the first five days after our arrival, 20 were either venereal or minor surgical. The remaining 42 were suspected of being typhoid, though a few proved not to be. The large number in the first days is accounted for by the long trip to Camp Meade and the heat and work of settlement in the camp.” That left 42 suspected of being typhoid fever up to the end of September; a few of these, they tell us at the Second Division Hospital, were cases of malaria. We have had more cases here in quarters that we have kept for a day or two which have yielded to quinine. A member of the board remarked: “Your regiment having arrived here on the 19th of September, you could not have sent any true ‘malaria’ to the hospital before the 1st of October.” Major Dennis stated that some of the men were down by the river, and that “at night the hollows are filled with fog. The physicians in Harrisburg tell us there is malaria all around here.” On October 1 there was 1 suspicious case; on the 2d, 2 cases; on the 3d, 2 cases; on the 4th, 1 case; on the 5th, no cases, making a total of 6 suspicious cases for the first five days of October. During the last twelve days (September 24 to October 5, inclusive) there were 14 cases that have been sent to the division hospital, and during the first five days (September 19 to 23, inclusive) there were 54 cases.

The present strength of the command is 864 men. Of these probably 30 have come back from furlough, the balance (834) having been men that have not had typhoid fever.

Up to this date (October 5, 1898) there have been 16 deaths in the regiment—a low mortality. “For a long time we were congratulating ourselves upon the mortality record, but since we came here a number of men that we left behind in Minnesota have died.”

COMMUNICATION FROM THE SURGEON OF THE FIFTEENTH MINNESOTA VOLUNTEER INFANTRY—MAJ. WILLIAM A. DENNIS, SURGEON IN CHARGE.

Location.—The camp was located on the State fair grounds, between St. Paul and Minneapolis. It had been occupied by the Twelfth Regiment for nearly three weeks after the first call. The ground was high, sloping rather abruptly toward the south and west and slightly toward the east, where there was a road. There was a pasture on the north.

Occupation and positions.—The first companies arrived on July 5 and within two or three days all were located. The last company, G, was mustered in on July 16. At this time the arrangement was this: A, B,

C, D, E, F, G, H, I, K, M, L. In a few days battalions were formed and the arrangement was this: (Ramsey) A, H, L, D; B, K, M, E; C, I, G, F. On August 23, when the regiment moved to Fort Snelling, as the result of the resignation of the colonel and the consequent promotions of battalion commanders and captain of Company A the following arrangement was made and still remains: B, K, M, E; C, I, G, F; D, L, A, H. (Snelling) (K, M, F, H in isolation camp about six days at Snelling, 2 miles from general camp.)

Water supply.—The water supply was at first from tank A via tank B. About July 20 it showed some minute vegetable particles, such as are regularly seen in lake water in the late summer, and tank C was cleaned out and used exclusively thereafter. It was supplied from a well 165 feet deep. All the tanks were on towers, about 30 feet above the ground. A was on a high point, B was low, and C was a little lower than A. All the tanks could be connected with a set of pipes supplying all the grounds occupied by buildings. Company kitchens were provided with 2 barrels each. These were filled as often as necessary by a tank wagon with an emptying hose, which in turn was filled from an L pipe. Water barrels were ordered scalded every second day. The tank wagon was inspected about July 20 and was to all appearances in good condition.

Sinks.—Liquid slops were thrown into sinks near the company kitchens. Solid refuse was thrown into barrels and collected daily by a scavenger. About July 28 the kitchen sinks were filled in, and thereafter liquid slops were collected in barrels and carried to a large sink beyond the latrine.

Company latrines were impracticable because of the narrow limits of the grounds. The men at first used a closet at E, but this was closed after about ten days and a latrine dug in the farthest angle of the grounds. The contents were at first covered daily with dry earth, but after the presence of typhoid was suspected a personal police was ordered by each man using the latrine. Some little time elapsed before this was satisfactorily carried out.

Beginning of fever.—Typhoid fever was suspected to be present about the 6th of August, and some men were sent to the St. Paul City Hospital on the 9th, but the Widal test was negative until the 13th. The diazo was also negative until this time. The absence of these signs, together with the suddenness of most of the attacks, there being no prodromal period in most of the early cases, operated to prevent an earlier positive diagnosis. So far as precautions against further infection went, it was agreed at the time to take the same measures as for typhoid, and all drinking water was at once ordered boiled and the use of ice discontinued. Specimens of water from the barrels of the companies most severely affected, and from the ice, gave abundant growths, but none were due to the bacillus typhosus. A few days later other specimens were taken from the

barrels, from hydrants near tank B, from hydrant near tank C, and from pipe D, and from the wagon. The specimen obtained from the tank wagon was reported by City Bacteriologist Miller, of St. Paul, to have shown the bacillus typhosus. At the time the water was ordered boiled the tank wagon was disinfected with live steam, and regularly every two or three days thereafter.

On August 14 the use of well water was discontinued altogether and water brought in tank wagons, treated as related above, from the St. Paul city water supply.

Moves.—On August 11 (this date is accurate within one day) all tents were moved 9 feet westward, for the purpose of removing them from the immediate ground they had been occupying, and the old sites were plentifully sprinkled with lime. On the 15th of August all the companies except F, H, K, and M (which had suffered much more severely than the others up to this time) were moved to the lower site on the fair grounds, shown on the map, and these four companies were moved to grounds heretofore unoccupied on the upper site.

On August 23 the whole command was moved to Fort Snelling Reservation, a distance of about 7 miles. The camp of the eight companies was about $1\frac{1}{2}$ miles distant from that of the other four mentioned. But in less than a week the four rejoined the others, for by that time they were having less than their proportion of new cases. An exception should be made in the above statement as to Company G, which remained twenty-four hours longer than the others on the Camp Ramsey grounds to police the grounds. Up to the time of the move this company had been practically immune, as shown by the map, but from this time its men were taken sick at an alarming rate, and it has suffered more severely than any other company, 6 of the 18 deaths resulting from the epidemic having fallen to it.

On September 15 the regiment left Minnesota for Camp Meade. Nine men were left at the Presbyterian Hospital, Chicago, one of whom died, and within a week after our arrival nearly 20 cases were sent to the First Division Hospital. Since that time there have been only a few scattered cases.

Measures taken.—The treatment of the water supply has already been mentioned, as also the changes in camp sites. The use of liberal quantities of lime was commenced on August 11 and has continued. Latrines were at first treated with dry earth once or twice daily, but a personal police by each man was recommended and ordered, but was not satisfactorily accomplished until after the command reached Fort Snelling. The sale, and use by the men, of foods such as pies and cakes and ice cream, fruits, pop and soda, and other articles that might tend to produce diarrhea was prohibited. Special tents were set aside for bathing and the importance of personal cleanliness emphasized.

The blankets of all men taken sick were treated with 1 per cent formalin or 1:500 bichloride solution.

At the time of moving to Fort Snelling it was planned to treat all clothing with formaldehyde gas and give all the men disinfected blankets in place of theirs, but on account of the length of time required this treatment was found to be impracticable. Each man was ordered to boil and wash one suit of underwear. Then he was to be given a cleansing bath followed by a bichloride bath, don his clean underwear and wash his other suit. In the meantime his uniform was to be subjected to the formaldehyde gas. It was found, however, that the underwear had been of poor quality and that most of the men, instead of having two suits, had none at all. Two companies, however, were treated in this way, the men being put to bed in the commissary building while the uniforms were being treated. For this purpose a small building about 12 feet square was obtained, and the clothing hung on lines in it. The building was sealed and the formaldehyde gas generated by Trillat's autoclave, conducted into it through the keyhole. The marking, hanging, treating, and sorting of the clothes took between six and eight hours, and as it could only be done when the men were asleep was not practicable for the whole regiment.

Diagrams.—The accompanying diagrams show the number of men taken sick in each tent in each of the four periods as follows: First, up to and including August 15, when the second site on the fair grounds was occupied—figures in black dots; second, up to and including August 23, when the regiment moved to Fort Snelling Reservation—figures in circles; third, up to and including September 18, when the regiment reached Camp Meade—figures in black dots; and fourth, up to the present time (October 30)—figures in circles. There were, of course, changes in occupants of tents. The records from which the chart was made are for August 15, and I believe are approximately correct, at least during the time when the vast majority of the cases must have been infected.

Your attention is directed to the peculiar history of Company G. Only one man was taken sick during the first period and three during the second. This company remained at Camp Ramsey (fair grounds) a day to police the grounds. That their infection could not have been due to the work is shown by the fact that they commenced coming down on the morning of the 24th, the day they left Camp Ramsey.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE FIFTEENTH MINNESOTA VOLUNTEER INFANTRY.

Camp Ramsey, near St. Paul, Minn., and Camp Meade, Pa.—Capt. John W. Finehout, commanding Company B, furnished a list of men in his company who suffered severely from typhoid fever, and stated substantially as follows: Our tents at Camp Ramsey

were in a single row numbered from 1 to 28. The companies were grouped in battalions at Camp Ramsey, beginning with the First Battalion on the left of the commanding officer's tent, as follows: First Battalion, Companies A, H, L, D; Second Battalion, Companies B, K, M, E; Third Battalion, Companies C, I, G, F. When we marched to Fort Snelling the captain of Company A was promoted to major, and Companies B, K, M, and E then became the First Battalion in the order named; Companies C, I, G, and F became the Second Battalion, and Companies D, L, A, and H in the order named became the Third Battalion. They remained in this order at Camps Snelling, Meade, and McKenzie until mustered out.

During the encampment at Camp McKenzie my company, B, was on detached service at Augusta, Ga., as a provost guard there from January 29, 1899, to March 2, 1899, during which time we were quartered in the armory at Augusta, and there was no sickness in the company at that time except a few colds.

My company came partly from a rural and partly from an urban population, 40 of them from the city of St. Paul. The average intelligence of the enlisted men was high. They were reasonably prudent as to personal conduct and habits affecting their health, and the financial status of the majority was above the average.

Of the other companies of my battalion Company M suffered more than my company. To sum up, our first camping grounds at Ramsey in the State fair grounds were very much too small. The regiment was strictly volunteers, mostly from the country, and they knew nothing about sanitary regulations. They partook most freely of "pop," lemonade, watermelons, pies, cakes, etc., which were permitted to be sold in the grounds. The water was taken from some pumps about three-fourths of a mile farther down the fair grounds. It was transferred, by means of the water wagon with hose attached, to the water barrels of the different companies. This hose became infected with the typhoid bacillus, and, with the intestines of the men in such condition by eating the stuff which the vendors were allowed to sell on the grounds, they proved to be easy victims. The grounds were small and very poorly drained, and the soil was not porous. About the 20th of July, 1898, there were very heavy rains, and the camp grounds were converted into a lake. Many of the men slept in water. It is a significant fact that the companies which were flooded the worst were the first and most severely to be affected with the fever. The sinks (kitchen sinks?) were too near the company kitchens and were not kept in a sanitary condition until after the fever had broken out. Companies H, K, M, and F were the first and worst affected with the fever. It was thought at first that the fever would be practically confined to these companies, and they were isolated while the other companies moved about half a mile farther toward the main

BAND TENTS

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7 0 5 4 3 2 1

DIRECTION TO
REGTL. SINKS

•=2
•=24
•=12
•=6

•=19
•=9

•=0
•=2

•=5
•=8

•=1
•=3

•=27
•=10

A



H



L



D



B



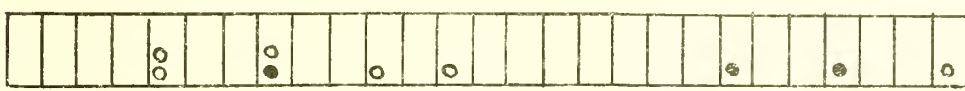
K



M



E



C



I



G



F



LINE OFFICERS

D

L

H

A

B

K

M

E

C

I

G

F

TENTS



COMMISSARY
TENT.

COLONEL

E

C

I

G

F

15th MINNESOTA V.I.

(No. 1)

• = ATTACKS UP TO AND INCLUDING
Aug. 15th.

○ = ATTACKS FROM AUG 16th TO 23rd
INCLUSIVE.



7654321

20

1

O. ATTACKS AFTER SEPT. 10.

entrance to the fair grounds to new and beautiful grounds. Later we moved to Fort Snelling, but it was too late: the men had all become infected with the terrible germs, and the other companies, with the exception of L from Duluth and C from Litchfield, suffered to some extent.

It will probably be of interest to you to know that I have recently had a long talk with Doctor Stone and Doctor Miller, who were at that time the commissioner and assistant commissioner of health of the city of St. Paul. Doctor Miller was a man famous for his accuracy in his post-mortems, and he told me that he performed the post-mortem of a private of Company A who was the first man in the regiment to die from typhoid fever. And he stated to me: "In all my experience I have never seen or heard of such a complete infection as was evinced by the post-mortem in this man's body. Not only were his intestines completely saturated with the typhoid bacilli, but also his stomach, gall, and every vital organ in his body."

This, I believe, tends to show how complete the infection was. I wish to further state that the board of health, which had jurisdiction of the fair grounds, had a close examination and chemical analysis made and prepared a lengthy report showing that the hose through which the water was transferred to the water barrels of the different companies was completely infected with the germs.

Capt. A. S. Crassfield, commanding Company E, furnished a list of his men grouped in tents, and stated substantially as follows: At Camps Ramsey and Snelling the tents were arranged on one side of the company street. Sergeant H. always bunked near the quartermaster's storehouse. There were some changes (in this grouping) when men were taken sick and the numbers in the company were less, though the grouping given shows approximately the location of the men at Camps Ramsey, Snelling, and Meade, with the exception that at Meade the tents were pitched on both sides of the company street, the last 13 numbers being on the left-hand side from headquarters.

ABSTRACTS FROM ORDER AND LETTER BOOK OF THE FIFTEENTH MINNESOTA VOLUNTEER INFANTRY.

HQRS. FIFTEENTH MINNESOTA VOLUNTEER INFANTRY,

Camp Ramsey, August 10, 1898.

COMMANDING OFFICER.

SIR: In view of the presence in the regimental hospital of a number of cases of illness which are suspected of being typhoid fever, but which can not yet be definitely so diagnosed, the surgical staff recommends the liberal use of lime in all sinks twice daily, and the personal police by each man of his own excreta. It would also recommend that all closets on the fair grounds used by the men be cleaned and disinfected, and that any that can not be placed in good condition be burned.

Respectfully,

W. A. DENNIS,

Major and Surgeon Fifteenth Minnesota.

[Telegram.]

CAMP RAMSEY, August 16, 1898.

SURGEON-GENERAL, U. S. Army, Washington, D. C.:

I have to make the following report: Camp Ramsey suffering from epidemic of typhoid. Diagnosis certain August 13. One hundred and twelve men removed to hospitals of St. Paul and Minneapolis. Well men removed August 15 to new and salubrious site on camp grounds. Others sick and under suspicion kept on old grounds. * * * Source of epidemic not definitely located. Twelfth Minnesota camping on same ground two months previous had several cases. All possible precautions being taken.

DENNIS.

HEADQUARTERS FIFTEENTH MINNESOTA,

Camp Snelling, August 27, 1898.

COMMANDING OFFICER FIFTEENTH MINNESOTA.

SIR: I have the honor to make the following recommendations affecting the sanitary conditions of the camp:

1. That at each of the camp sinks each man be required to do his own policing, but that a special detail of one or two men be made to treat all of the sinks of the camp daily with lime.
2. That all water barrels be thoroughly scoured every second day, and garbage and swill barrels washed; that special care be taken to separate solid and liquid refuse.
3. That until the health of the camp is much improved the following articles be not used: Green corn, cucumbers, melons, grapes, tomatoes (excepting in soup), cabbage (green); that as little grease as possible be used and served, and that boiling be the prevailing mode of preparation rather than frying.
4. That the greatest importance be attached to the order forbidding men to cross the ravine between the camp and the water supply, since otherwise the whole post and camp may readily be infected with typhoid fever.
5. That the men be impressed with the great importance of personal cleanliness in preventing disease, and that every man be urged, but not ordered, to wash his trousers thoroughly when at the river. That but one battalion be allowed to go to the river each day.
6. That men ordered to the hospital be provided with a clothing list—trousers, towel, blouse, blue shirt, shoes, hat, pouches, and a blanket—which shall be receipted by the chief steward.

DENNIS, Surgeon.

CAMP SNELLING, September 1, 1898.

COMMANDING OFFICER FIFTEENTH MINNESOTA.

SIR: The surgical staff has the honor to make the following report on the sanitary condition of the camp:

Companies H, K, D, and L have piles of straw, hay, paper, and baskets about their sinks that should be disposed of. The slop sink used by Companies D and L contains melon rinds, paper, and lemon peeling, and is in a filthy and insanitary condition. The ground about the sink is not policed.

The same is true of Company F.

Company G has no lime.

Company I has no slop sink. The men's sink should have been filled and a new one dug some days ago. Feces remain uncovered.

Company C's sink is almost invariably filthy, and neither earth nor lime used.

Company E has no slop sink, and the men's sink is unpoliced.

Company M's sinks are in bad condition; no policing apparently done. All sorts of refuse are thrown in the slop sink.

Company K has no slop sink.

Company B needs a new kitchen sink. Gunny sacks, paper, and other refuse have been thrown into the present one.

The noncommissioned officers' sink has had no attention of any kind.

The commissioned officers' sink should be filled and a new one dug, and it should be provided with a barrel of lime.

The men's sinks should be treated with lime two or three times daily. At least half a barrel should be used each time, slaked with water.

(Signed)

DENNIS, *Surgeon.*

HEADQUARTERS FIFTEENTH MINNESOTA,
Camp Snelling, Minn., September 12, 1898.

COMMANDING OFFICER.

SIR: The surgical staff has the honor to make the following recommendations:

That tent floors be thoroughly scrubbed twice weekly.

That each company, with proper instructions from the medical department, disinfect its surplus blankets each day up to the day of its departure for Camp Meade.

That the attention of the company commanders be again called to the absolute necessity for personal cleanliness in avoiding disease in a body of troops. The men must have a bath at least once a week, and in mild weather two baths a week should be the rule. Tents and water can and must be heated, if necessary, for this purpose. Sufficient means should be provided to enable each man to wash his hands before each meal, and commanders should do all in their power to see that the men do this.

That the quartermaster be instructed to purchase 12 gallons of crude carbolic acid for disinfecting purposes while en route to Camp Meade.

DENNIS, *Surgeon.*

HEADQUARTERS FIFTEENTH MINNESOTA,
Camp Meade, September 29, 1898.

COMMANDING OFFICER FIFTEENTH MINNESOTA.

SIR: In view of the severe epidemic of typhoid fever from which the Fifteenth Minnesota is just emerging, the surgical staff would respectfully recommend that authority be asked to reduce the amount of drill to such limits as may be deemed advisable, taking into consideration the condition of the men and of the weather from day to day. It has been repeatedly demonstrated since the beginning of this epidemic that hot weather and hard work cause a marked increase in the number of cases coming down. Such an increase has been noticed since the present drill schedule went into effect. With light drills, during the cooler hours, it is believed that the disease will soon be practically eradicated.

DENNIS, *Surgeon.*

In a communication to his commanding officer at Camp Meade, dated October 2, 1898, Major Dennis makes a similar protest, in the name of the medical staff, against the proposed march of the regiment, with the brigade to which it is assigned, to Mount Gretna and return, a distance of 20 miles.

OFFICE OF THE CHIEF SURGEON FIFTEENTH MINNESOTA,
Camp Meade, Pa., October 2, 1898.

ADJUTANT FIFTEENTH MINNESOTA.

SIR: The special report mentioned in the fourth indorsement of the accompanying paper is respectfully submitted:

"Of the 62 cases sent from this regiment for treatment, 54 were sent during the first five days after our arrival (at Camp Meade); and of these 54, 20 were either venereal or surgical; the remaining 34 were suspected of being typhoid, though a few proved not to be so. The large number on these five days is accounted for by the confinement of the long trip to Camp Meade, the heat, the fatigue of the march to camp, and settlement therein.

"During the last week in September only 8 cases were sent to the division hospital, and only two regiments in the division can show a better record for that period."

DENNIS, *Surgeon.*

Letter from S. W. Mowers, first lieutenant and assistant surgeon, reports that a corporal, Company I, was taken sick October 7, in Harrisburg, and went to the hospital there. The reporter saw him August 13, when he was suffering from acute gastro-enteritis. He ordered him to report to camp as soon as possible.

A letter dated from the Presbyterian Hospital, city of Chicago, October 28, to Major Dennis, refers to patients of the Fifteenth Minnesota in that hospital. The letter is signed by H. B. Stehman, superintendent.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

July.—(Camp Ramsey, St. Paul, Minn.) Mean strength averaged for ——— days: Officers, 46; enlisted men, 1,279; total, 1,325. Admissions from command, 131; total to account for, 131. Of 118 completed cases, 118 returned to duty. Remaining on sick report in hospital, 4; in quarters, 9; total, 13.

Maj. W. A. Dennis, who signs, makes no remarks.

August.—(Fort Snelling, Minn.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,277; total, 1,323. Remaining from last month, 13; admitted from command, 572; total to account for, 585. Of 281 completed cases, 276 returned to duty, 4 died, and 1 deserted. Remaining on sick report in quarters, 304.

The report is neither signed nor are any remarks made.

September.—(Camp Snelling, Minn., and Camp Meade, Pa.) Mean strength averaged for thirty days: Officers, 46; enlisted men, 1,258; total, 1,304. Remaining from last month, 304; admitted from command, 366; total to account for, 670. Of 293 completed cases, 216 returned to duty, 11 died, 5 were discharged. (The fact is not stated, but it is evident that the remaining 61 completed cases are sent to other hospitals.) Remaining on sick report in quarters, 377.

Abstract of remarks by Maj. W. A. Dennis, surgeon:

The regiment left Camp Snelling, Minn., September 15, 1898, and arrived at Camp Meade, Pa., September 18. Left in 3 divisions, the first consisting of the First Battalion, with Surg. W. A. Dennis; the second, of the Second Battalion, with Asst. Surg. S. W. Mowers; the third, of the Third Battalion, with Asst. Surg. C. W. Fry. It has since that time been stationed at Camp Meade, near Middletown, Pa.

The epidemic of typhoid fever, which commenced at Camp Ramsey, Minn., early in August, is now at an end. Some of the cases, as shown by this report, are still in hospital, while a great many, also shown, are on furlough. Those first taken sick are now returning from furlough.

The cause of the epidemic has not been definitely located, though the medical officers of the regiment have had the assistance of the health officers of the State of Minnesota and the city of St. Paul. The water was probably infected, but when and how it became so is not known. The command was immediately ordered to drink only boiled water, and later that from the St. Paul water system was supplied. Blankets were disinfected as fast as men became sick. A personal police by each man was ordered, and lime was used in abundance. Part of the clothes were disinfected

with formaldehyde gas, but this measure was found to be impracticable for the whole regiment. The men were instructed in the importance of personal cleanliness and care as to diet. The sick were removed by order of the Surgeon-General to the hospitals of St. Paul and Minneapolis. Companies most seriously affected were isolated, and all were moved twice onto new ground before coming to Camp Meade.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,242; total, 1,288. Remaining from last month, 377; admitted from command, 321; total to account for, 698. Of 431 completed cases, 478 returned to duty, 3 died, and 1 was discharged. Remaining on sick report in quarters, 216.

Maj. W. A. Dennis, who signs, makes no remarks.

November.—(Camp Meade, Pa., and Camp McKenzie, Augusta, Ga.) Mean strength averaged for thirty days: Officers, 46; enlisted men, 1,227; total, 1,273. Remaining from last month, 216; admitted from command, 253; total to account for, 469. Of 382 (?) completed cases, 334 returned to duty, 13 were transferred, and 3 were discharged. Remaining on sick report: In hospital, 8; in quarters, 111.

Abstract of remarks by Maj. W. A. Dennis, surgeon:

Regiment left Camp Meade, Pa., November 16, 1898, arriving at Camp McKenzie, Ga., November 18, 1898. Moved in three sections, the First Battalion under medical care of Acting Assistant Surgeon Taylor, the second by First Lieut. S. W. Mowers, and the third by Maj. W. A. Dennis.

Nothing occurred calling for report.

December.—(Camp McKenzie, Augusta, Ga.) Mean strength averaged for thirty-one days: Officers, 32; enlisted men, 1,121; total, 1,153. Remaining from last month, 119; admitted from command, 245; total to account for, 364. Of 310 completed cases, 285 returned to duty, 4 were discharged, and 4 were transferred. Remaining on sick report: In hospital, 6; in quarters, 48.

Maj. W. A. Dennis, surgeon, who signs, makes no remarks.

PARTIAL REPORT FROM THE MINNESOTA STATE BOARD OF HEALTH ON AN OUTBREAK OF TYPHOID FEVER AT CAMP RAMSEY, MINN., AUGUST, 1898.

By DR. H. M. BRACKEN, *Secretary and Executive Officer.*

On July 6 the Fifteenth Minnesota Volunteers went into camp at the State fair grounds, situated between St. Paul and Minneapolis, the site chosen being the same at every point as that formerly occupied by the Twelfth Regiment while recruiting.

The State fair grounds occupy about 200 acres of land, upon which are many permanent buildings. At one end of the grounds is an unoccupied space and upon this was placed the camp.

On August 5 there was a heavy shower over the camp, and on August 7 sickness appeared quite generally in four of the companies of the regiment, viz, Companies F, H, K, and M, and of these K and M were the only ones adjoining each other.

The epidemic was quickly recognized as typhoid fever. It was mild in type. While trying to find the cause of the outbreak a change was made in the water supply. The ice had been discontinued until there had been sufficient time to examine into its source, and then precautions were taken under the directions of the medical staff of the regiment. The water supply had been taken from a driven well, 135 feet deep, located on the fair grounds, and situated 400 yards from the camp site. From this well the water was raised by a steam pump into a covered wooden tank, the top of which was about 25 feet from the ground. Pipes leading from this tank distributed the water to various portions of the fair grounds, though not to any point nearer the camp site than the well itself. The water was hauled to the mess tanks in an old wooden barrel-shaped tank. This wagon tank was filled at a standpipe 30 yards from the original supply tank through an old rubber hose attached to the standpipe. It was emptied at the mess tanks through a dilapidated rubber hose, attached to the wagon tank, into loosely covered barrels. There were three of these barrels for each company, one for drinking and two for cooking purposes.

Investigation was first taken up through the St. Paul city health department, under the mistaken idea that the fair grounds were within the city limits. The mistake having been corrected, the State board of health took hold of the sanitary work required and in assisting the officials of the regiment. August 13 Dr. F. F. Westbrook, director of the bacteriological laboratory of the State board, and myself visited the camp and suggested certain precautionary measures in addition to those already in force. On August 16 Surg. Maj. W. A. Dennis met with certain members of the State board, at its office, to arrange some definite line of action. The result was the following programme:

1. To have two new camps:
 - (a) For the uninfected companies.
 - (b) For the infected companies.
2. Not to grant sick furloughs to any of the officers or men without notifying the State board of health of such action and giving the address of the party on furlough.
3. To have strict guard duty carried out, in order to prevent too general mingling of the sick and the well.
4. (a) That hospitals (in St. Paul and Minneapolis) receiving patients from this regiment be required to furnish specimens of blood for the Widal reaction test from each patient every day until the diagnosis of typhoid fever shall be made or rejected. In the event of the case proving to be one of typhoid fever, these hospitals were to furnish blood specimens for each case every third day so long as desired by the State board of health.
- (b) That each hospital be required to make the diazo reaction test for each patient, being governed as to the time for making such by the same rules as applied to the Widal reaction test.
- (c) That urine from each typhoid-fever patient be furnished the State board of health, in sterilized receptacles furnished by the laboratory, every three days after the appearance of the serum (Widal) reaction so long as desired by the laboratory.
- (d) That a personal history be furnished the State board of health for each typhoid-fever case for the two weeks previous to the appearance of the illness.

(c) That a complete diet list for soldiers in camp, including bread, meat, milk, water, ice, vegetables, etc., also the methods of keeping food before and after cooking, be furnished the State board of health.

5. That special examinations of feces, earth, straw, flies, etc., be made by the State board of health laboratory as thought necessary.

6. That for each patient the name, rank, company, tent number, previous residence, present residence, and date of appearance of illness be given.

Carrying out the first of these suggestions, the first camp was abandoned, the uninfected companies being located a considerable distance from the old site, while the four infected companies were moved only a short distance.

In connection with the original camp site, it may be well to state that the camp was located on rolling ground, well drained; the sinks were located near the race track and 100 yards to the westward of the company kitchens, and the drainage from the sinks was away from the camp. These sinks were several feet deep and were in sand, with a loam top dressing. An attempt was made to police them very thoroughly, but this was not done quite as it should have been. Lime was used freely, and when partially filled with feces an abundance of lime was added and the sink filled up with dirt. An attempt was made (somewhat imperfect, probably) to carry out disinfection of the rails, etc., over the sinks.

The kitchens for each company were located in the rear, to the north of each company. There was free movement of flies from the sinks to the kitchen and vice versa.

Point 2 was requested by the State board of health in order that it might be able to follow furloughed soldiers home and protect the neighborhood to which they went by notifying the local health officer.

Point 3 had a direct bearing upon the control of the epidemic in camp.

Point 4 had a distinctly scientific bearing upon the investigation of the epidemic—a bearing that would naturally have a value in proportion to the thoroughness with which it was carried out. In these various hospitals of the two cities the soldiers were in most, if not all, cases under the care of the Red Cross physicians instead of the regular hospital staff. While some of these Red Cross appointees followed out the instructions of the regimental surgeon, others took little interest in the matter, and others utterly ignored the order (or request). Thus the opportunity for a thorough scientific report was hindered.

Points 5 and 6 had a bearing upon the cause of the outbreak and will be covered in the report from the bacteriological laboratory.

It should be stated that while there was no positive proof that the water from the deep well on the fair grounds was infected, this source of supply was never resumed after its discontinuance at the first appearance

of the epidemic. Water was hauled from a hydrant connected with the St. Paul city supply (a recognized safe supply) in tanks that were regularly sterilized by steam.

As having some bearing on the case, it should be stated that Camp Ramsey was conveniently situated on one of the interurban electric lines between St. Paul and Minneapolis; that the soldiers were furnished free transportation to both cities by the electric line referred to, and they freely used their privilege; that the city water of Minneapolis has been notoriously an infected water for several years; that the soldiers were raw recruits and indulged themselves to the limit of their opportunity and their purse; that infection, once introduced into the sinks of the camps, might easily be conveyed by flies to the food in the kitchens or on the soldiers' plates; that there was probably no danger of infection of the well water from the sinks, for they were quite distant from the wells, and their drainage, if any, would be in quite the opposite direction; and, finally, that the sudden appearance of the disease in four companies, while the other companies, not immediately infected, were using the same drinking water, would point strongly to a food or tent infection rather than infection through the water supply. Infection was not limited to the four companies cited; for, in spite of the transfer of the eight apparently healthy companies to the new site, the disease persisted, as we would naturally expect it to do. At the same time it should be noted that the epidemic was chiefly in one end of the camp at first, and although one company, G, as originally arranged, did not have many cases at first, it became thoroughly infected later.

From a diagram furnished by Major Dennis to the board two have been constructed, for more clearly displaying certain peculiarities. He states:

Our epidemic is now ended and I can send you the map completed. We have divided the time into four periods: First, up to and including August 15, when the eight companies moved onto the lower fair grounds site and the other four companies took new ground on the upper site. The second period extends from August 16 to 23, inclusive; on the latter date we moved to Fort Snelling. The third period extends from August 24 to September 18, inclusive; on the latter date, late in the evening, we arrived at Camp Meade. The fourth period includes all cases since our arrival, most of them being in the first five or six days.

(Of the two tent diagrams made by the board instead of the one by Major Dennis, the first embraces the first two periods and the second comprises the last two; the black dots represent first and third period attacks, while the black rings show the second and fourth period attacks, respectively.)

There were undoubtedly some changes in tent occupants, but these it is impossible to follow, and I think the charts from which the map is taken represent the arrangement very nearly correctly for the time when infection occurred. Apparently there were very few infections at Snelling, excepting possibly in Company G, although a good many were taken sick there. In Company G

there were two or three rather stubborn fellows, through whose influence the men of that company were kept from reporting for several days after being taken sick, and I believe that in this company there were undoubtedly some infections from tent mates. Until about July 20 the companies were arranged alphabetically, except that M preceded L, thus: A, B, C, D, E, F, G, H, K, M, L. Then they were arranged in battalions and were arranged thus: A, H, L, D; B, K, M, E; C, I, G, F. Colonel Shandrew's resignation and the consequent promotions resulted in another change August 23, which arrangement still remains, thus: B, K, M, E; C, I, G, F; D, L, A, H. Of the four companies first and earliest affected M and K are the only ones adjacent to each other, and they have been so continuously.

We have had a very satisfactory sick report as compared with other regiments of our division the past month. The weather of late, however, has been very rainy and damp, and I believe we are having a good deal of malaria. The cases are not the typical ones described in Osler, but they have the earmarks and do not fit anywhere else and almost invariably respond to quinine.

It is worthy of note that the infection was not in that part of the camp nearest to the sinks. Quite the reverse. Surgeon-Major Dennis was advised by Surgeon-General Sternberg to accept the offered assistance of the Minnesota State board of health. The relations between State sanitary authorities and army officials was most harmonious during the entire period that the regiment was in Minnesota.

EXTRACTS RELATING TO TYPHOID FEVER IN THE FIFTEENTH MINNESOTA VOLUNTEER INFANTRY, FROM THE ANNUAL REPORT OF THE MINNESOTA STATE BOARD OF HEALTH, 1895-1898.

H. M. Bracken, secretary and executive officer, states (pp. 114-116) as follows:

August 13 I reached home again from the conference (with the surgeons of the Fifteenth Minnesota) and found great anxiety over typhoid fever at Camp Ramsey, on the State fair grounds. Sickness began there August 7 (1898), about one month after having gone into camp, on the same ground previously occupied by the Twelfth Minnesota Volunteers.

The character of the fever was mild. The probability of infection from the drinking water was slight, for the disease instead of appearing quite generally throughout the camp, as it would have done had the drinking water been the cause, became epidemic at once in four companies. These companies were not contiguous to one another. The St. Paul bacteriological laboratory had already taken up the investigation of the water supply of the camp. The State laboratory at once began a thorough investigation of all possible sources of infection, and also the work of studying bacteriologically all the cases of typhoid fever originating in the camp.

About August 20 the question of moving the Fifteenth Regiment from Camp Ramsey to Fort Snelling Reservation was discussed, and on August 23 the move was made.

The working of this board in conjunction with the army officials looking to the control of this epidemic has been most harmonious and satisfactory from beginning to end.

In order to remove all fear as to the safety of the fair grounds for fair purposes, the State board of health was asked to take the matter in hand, and this was done. The State fair officials were requested to pursue the following course:

To disinfect the old camping grounds by burning straw over them, and then to sprinkle them with a 3 per cent solution of crude carbolic acid.

To fence off the area including the sinks in the new camp.

To disinfect and fill all small vaults, and to use plenty of lime (2 barrels or more) in each of the large vaults.

To burn all the small water-closets.

To whitewash under the seats of the large water-closets, to cleanse the floors and seats thoroughly, and to paint the side walls up to the rafters.

To disinfect all tanks and water pipes with steam, forcing it to escape through the various taps on the grounds.

To disable all pumps, thus preventing the use of any of the wells on the grounds.

To make connection with the St. Anthony water system, thus securing water for the grounds that would be above suspicion.

To sprinkle lime on the grounds where water has been standing about the pumps.

To disinfect all the camp trenches, using plenty of lime, and to whitewash the fences near the trenches.

To use lime in the stable where the regimental horses were kept and to whitewash the walls; to use lime on the manure about these stables.

To clean the late commissary building thoroughly.

All this was well done under the supervision, at my request, of Dr. George A. Gray.

F. F. Westbrook, M. D., director of the Minnesota State bacteriological laboratory, states as follows:

On August 16, 1898, on an invitation of the Surgeon-General of the United States Army, this laboratory undertook the investigation of the outbreak in collaboration with the military authorities. The essential facts brought out in this joint investigation are about as follows: On July 6 the Fifteenth Minnesota Volunteers, composed of men from various portions of the State, was mobilized at the State fair grounds and placed in camp on the grounds formerly occupied by the Twelfth Minnesota Volunteers. This latter regiment had had no cases of recognized typhoid fever, either while at the camp or for three weeks after leaving it.

The camp was on high ground on the northeast corner of the State fair inclosure. The soil was the ordinary gravelly glacial drift of the locality. The privy and kitchen sinks were to the northwest, in the area formed by the race-track tangent, to the north side of the grounds, and more than 100 yards from the nearest tents.

The company mess tents were at the north end of the camp and the office and hospital tents at the opposite extremity. The tents had all been pitched on exactly the sites occupied by the tents of the Twelfth Regiment. The quartermaster stores were kept in one of the State fair buildings, 30 yards south of the camp. Butter and fresh meat were delivered every morning at the company mess tents and there placed in loosely covered barrels on ice wrapped in cloths.

No milk was served until the outbreak of fever. The original source of the water used for cooking and drinking purposes was a driven well, lined with galvanized-iron pipe, 135 feet deep, and situated 400 yards south of the camp site. From this well the water was forced by a steam pump into a covered wooden tank, the top of which was about 25 feet from the ground. Pipes leading from this tank distributed the water to various portions of the State fair grounds, though not to any point nearer the camp site than the well itself. The water was hauled to the mess tents in an old wooden barrel-shaped tank. This wagon tank was filled at a standpipe, some 30 yards from the original supply tank, through an old rubber hose attached to the standpipe. It was emptied at the mess tents, through a dilapidated rubber hose attached to the wagon tank, into loosely covered barrels. There were three of these barrels for each company, one for drinking and two for cooking purposes.

Aside from the hygienic conditions noted above, it should be stated that the men were largely from the smaller towns and farming districts of the State; they were volunteers, not yet accustomed to discipline; that they had free run of the State fair grounds and

the numerous water-closets, drinking taps, fruit stands, etc., thereon; and that they were frequently given leave of absence from the grounds to visit the cities of St. Paul and Minneapolis, to which they had free transportation on the street cars.

About August 3 typhoid fever made its appearance simultaneously in four of the twelve companies. These companies were encamped quite widely apart, two or three unaffected companies being between each pair of those affected. From August 3 to August 15 a large number of cases developed in the four companies as noted, being somewhat evenly distributed along the four company lines, though not showing to any extent in the other companies of the regiment. About this time all the unaffected companies were removed to the southern portion of the fair grounds, the rubbish on the original site being burned up, along with the straw from the men's beds, and the tents of the affected companies removed several yards distant from the original sites. From this time on scattered cases arose among all the companies, though the four first affected maintained their original higher percentage of sick. The whole regiment was moved to the Federal reservation at Fort Snelling August 23, and from thence to Camp Meade, Pa., about September 15.

About August 15 the St. Paul city laboratory, under the erroneous impression that the camp was under the jurisdiction of the city, began the bacteriological examination of water from the various supply taps, etc., on the grounds, and succeeded in isolating from water collected from the hose attached to the wagon tank (mentioned above) an organism which biologically resembles in many though not in all points the *Bacillus typhosus*.

On August 20 this laboratory collected water from three taps supplied from the main tank, from a surface well in a barnyard on the fair grounds, and from one of the barrels at the mess tent of Company H (the most affected company). Flies were caught in sterilized metallic traps in the regimental privy trench and on the food barrel at the mess tent of Company H.

All these were carefully examined for typhoid organisms, and a bacillus was isolated from the bodies of the flies secured at the mess tents which in most though not in all respects resembles the *B. typhosus*. The results of the examination of the other specimens were entirely negative. The organism isolated from the water by the St. Paul city laboratory and the one isolated from the flies by this laboratory are still under investigation.

Repeated tests for the Widal reaction in the blood of the men with suspected typhoid fever were made in 342 cases. Of these, 241 gave one or more positive reactions. A few cases from the regiment were not tested, owing to the fact that specimens were not sent in by attendants in the hospital to which the patients were sent. Full information has not yet been received from the hospitals concerning the history of all cases.

A map showing the location and date of attack of all the early cases, which was asked for by this laboratory from the surgeon-major of the regiment, is not yet at hand. When this data and also further information concerning the true nature of the organisms still under investigation are obtained, a detailed report will be made. The secretary will report on the quarantine and disinfection measures taken at various times during the epidemic.

CONCERNING TYPHOID FEVER IN THE FIFTEENTH MINNESOTA VOLUNTEER INFANTRY, DATED JANUARY 21, 1899.

[Extracts from a communication to the president of the board by Dr. F. F. Wesbrook, director of Minnesota State bacteriological laboratory.]

At the last quarterly meeting of the Minnesota State board of health, held a few days ago, I secured permission to forward you those portions of the quarterly reports of the laboratory for the quarters ending September 30 and December 31, 1898, in which the

epidemic of typhoid fever in the Fifteenth Minnesota Volunteer Infantry was dealt with. They are herewith inclosed.

From the report sent you by Doctor Bracken recently, of which I have a copy before me, it is evident that he has furnished you with rough maps and plans.

In making a systematic search for the possible original source of infection and the possible means of continued distribution of the contagium, to which the daily occurrence of new cases for a considerable period apparently pointed, the laboratory had asked immediately for a plan of the arrangement of the tents, indicating the position of the infected soldiers and the date of the appearance of the illness. Owing to the great amount of work thrown suddenly upon the army medical officers, this was not furnished until the active work of the laboratory had ceased and its value as an index of the advisability of making systematic bacteriological examinations for typhoid bacilli in the materials and places thus possibly brought to light had been lost. In fact, had this been furnished then it would have been found very difficult to obtain data and materials after the patients had gone to the various hospitals and out of the direct control of the army medical officers.

In order to facilitate matters in this respect and to save time and trouble to Surgeon-Major Dennis, 10 copies of a letter written to him and giving in detail the points upon which data was required were forwarded with the request that he accompany them by a personal note of request or command. He followed the suggestion, but largely without any resulting improvement.

Source of infection.—The original source can only be guessed at. The close proximity and ease of access to Minneapolis, in which city something over 3,000 cases of typhoid fever were estimated in 1897 and something less in 1898, may explain the first cases. After the original infection there were so many possible means of distribution permitted before the disease was diagnosed and which were impossible of complete correction in a camp of raw recruits that it is not strange that the infection became so wide spread.

General water supply.—This is referred to and described in the first report from the laboratory. The unequal distribution of the fever, i. e., being confined for a long time nearly altogether in four companies; the fact that no cases of the disease had occurred either in the Twelfth Regiment stationed there before, or among the employees of the agricultural society resident on the grounds; that the nature and slope of the surface of ground and underlying soil and the mechanism of pump, tank, and pipes were such as to render infection improbable from such cases had they occurred and been unrecognized, and the fact that the infection continued or increased after the sterilization of the containers and the discontinuation of this supply all seemed

to exclude the water as a source of original and subsequent infection.

The finding of a bacillus almost, if not entirely, identical with *B. typhosus* by Dr. A. W. Miller, bacteriologist to the St. Paul board of health, in the water as it flowed from a dilapidated rubber hose attached to the barrel-shaped delivery-wagon tank used for distributing water to the different company mess tents can not, however, be entirely overlooked. This micro-organism may have been picked up by the hose, which sometimes trailed on the ground, or may have been infected from the hands of attendants.

The micro-organism was sent to this laboratory for corroboration by Doctor Miller with three other pure cultures of *B. typhosus*, isolated from the spleen, gall bladder, and mesenteric glands of one of the fatal cases. The microbe in question had been obtained by the addition of the collected water to broth, incubation for some hours, and injection into the peritoneal cavity of a white rat, which it killed in less than twenty-four hours. From the peritoneal exudate of the rat it was obtained in pure culture without difficulty by Doctor Miller, who gave the foregoing account.

The method of procedure involved was one which has never been employed in this laboratory, but the culture was examined and compared through all the culture media with five known typhoid cultures, three others then unknown, and five cultures of *B. coli communis*. It proved in the earlier experiments to be quite similar to the other cultures of *B. typhi*, except that the growth upon pieces of the same potato was more abundant and of a yellowish-brown color, and that at the end of forty-eight hours indol was to be clearly detected in cultures in Dunham's solution. This latter property has since disappeared. It is of the same size and degree of motility, and reacts to known typhoid blood in parallel tests with cultures of *B. typhi abdominalis*, and is of a corresponding degree of virulence for animals. Whether it was present in the general water supply and the significance of its discovery in the material from which it came, in the light of the method employed, are matters upon which this laboratory can not give any opinion.

The examination made by this laboratory, and all other examinations made by Doctor Miller of water from the various taps, pipes, mess-tent barrels, etc., which resulted negatively, are of course of little value.

Irr.—This was examined by Doctor Miller with negative results, but its use was discontinued in drinks immediately after the appearance of the first cases, though it was kept in closed barrels for the preservation of foods. It can not therefore have been responsible for the latter cases, and the history of its source which showed it to be generally used in the city of St. Paul (which city has been free from typhoid fever) would seem to indicate that it was not the original cause of the epidemic.

Milk.—Milk was never supplied to the soldiers until after they had become infected—that is, until they required it for nourishment during the course of the disease.

Food.—A complete diet list was never received, though earnestly asked for, but in the opinion of the laboratory certain of the company mess tents appeared to be places from which infection very widely spread immediately after the initial infection. This opinion was based upon topographic distribution of cases—that is, in 4-company rows.

It is not contended that this was the only factor even at this stage, and certainly not after attention had been called to it. In addition to food, water, and personal infection must be considered the company privy sinks.

Sinks.—The original positions of the privy and kitchen sinks relative to the company mess tents was one worthy of some attention. One of the kitchen sinks was between the west end of the long line of company mess tents and the privy sinks, considerably closer, however, to the former. A glance at the plan of the original camp site, if you have one, will show these relative distances.

Inspection of the privy sinks even after the placing of a guard there to compel the covering of all feces and urine with lime immediately after their excretion showed large uncovered masses of feces, newspapers, etc., and fouling of the rails after occasional washing with a disinfectant which had been suggested.^a The use of these sinks by incipient and ambulatory cases would afford ample opportunity for direct personal and indirect food infection.

Flies, too, swarmed here, and it needed no very strong gale of wind, though one had occurred, in the right direction to carry them from here to kitchen sinks and mess tents.

In one of the company mess tents (H) the cooked and other food was kept on ice in a barrel carefully covered with a gunny sack, which upon being lifted revealed large numbers of flies which had gained access through cracks. Whether this was true of the food barrels in the other infected companies or not is unknown.

Cultures from flies.—On August 23 flies were caught in sterile (autoclaved) metal cages, carried from and to the laboratory in sterile paper from the privy sink (suspension of flytrap by a string for ten minutes), and from Company H mess tent by setting upon cloth used for covering meat. The flies were induced to escape from the trap through inverted sterilized funnels into sterile flasks, where they were drowned by pouring sterile broth upon them. These cultures were incubated twenty-four hours and plates then made. From the

^aEven after removal from Camp Ramsey to the Fort Snelling Reservation after suggestions before and then made by this board and the strongest requests of Surgeon-Major Dennis and the other army medical officers, owing to the inability to get lime incident upon the great work and interference with routine of the moving of camp, the privy sinks were not properly disinfected.

flies caught at Company H mess tent a bacillus was isolated from two colonies which has the appearance of *B. typhi abdominalis* except that (a) growth is usually more abundant in the same length of time on agar and potato; (b) the virulence for animals has not been definitely established; (c) it does not react to known typhoid blood.

Attempts are now in progress to establish or increase its virulence, and to see if it is not possible to make it react to typhoid blood, on the assumption of the possibility that it is *B. typhi abdominalis*, somewhat changed in character by its residence in or on the bodies of flies.

All other cultures resulted negatively, and in view of the great number of possibilities offered for infection and the large amount of work being done in examining the blood of patients, the further examination of earth, foods, water, feces, etc., in an attempt to change possibilities to probabilities was not deemed necessary.

Blood examinations.—Accounts of this work are given in the quarterly reports. It is necessary to state here that the method used was that originated by Doctor Wilson, and used in this laboratory since October, 1897. (See paper read before American Public Health Association October 26, 1897, at Philadelphia.)

It is a matter of regret that concurrent bacteriological examinations of excreta could not have been done in all cases.

In summing up, the only positive result obtained is that regarding the blood reaction as corroborative of clinical diagnosis an epidemic of typhoid fever has occurred.

There is no absolute proof of when, why, or where it originated, nor of how it was distributed after the first case or cases. There are, however, innumerable possibilities, of which some may be regarded as strong probabilities. Among them the following might be mentioned:

1. Infection of one or more cases either before or after mustering in.
2. Infection of privy sinks or general grounds from No. 1, discipline being necessarily lax at first and there being no apparent reason for particular care.
3. Infection of food or water in the mess tents of Companies H, K, M, and F from Nos. 1 or 2.
4. Direct infection of cases more general in distribution from the rails, flies, etc., of privy sinks.

RESULTS OF BLOOD EXAMINATIONS IN CASES OF TYPHOID FEVER IN THE FIFTEENTH REGIMENT MINNESOTA VOLUNTEERS.

By F. F. WESBROOK, M. D.

Surgeon-Major Dennis's report shows a total of 406 cases of typhoid in this regiment, 346 of which occurred before the departure for Camp Meade. The laboratory examined specimens from about 342 men, not all of whom had typhoid. Of the 342 patients from whom the specimens were examined clinical data has been returned by the attending physicians on but 58.

Of the 342 patients from whom specimens were obtained, positive "Widal reactions" were found, one or more times, in 241 cases; negative reactions only were present in 87 cases; and in 14 cases only partial or doubtful reactions were obtained.

Of the 241 cases which at some time gave a positive reaction, only 107 were examined on or before the seventh day. Of these, 62 gave positive reactions on days of the disease, as follows: One on the first day of the disease; 7 on the third day of the disease; 10 on the fourth day of the disease; 8 on the fifth day of the disease; 10 on the sixth day of the disease; and 26 on the seventh day of the disease.

Of the remaining 45 cases, 41 were examined only once, with negative results, before the seventh day, and were not again examined until too late in the disease to make the positive results then obtained of any value in determining the data of the appearance in the blood of the agglutinating substance.

The four remaining cases are of special interest, and the record of their examination is given in full.

Case A.		Case B.		Case C.		Case D.	
Day of disease.	Reaction.	Day of disease.	Reaction.	Day of disease.	Reaction.	Day of disease.	Reaction.
7	Absent.	5	Absent.	7	Absent.	5	Absent.
10	Do.	10	Do.	10	Do.	10	Do.
11	Do.	11	Do.	11	Do.	11	Do.
12	Faint.	16	Do.	16	Do.	16	Do.
16	Absent.	17	Present.	17	Present.	17	Present.
17	Present.	18	Do.	18	Absent.	18	Do.
18	Absent.	19	Absent.	19	Present.	19	Faint.
19	Faint.	21	Present.	30	Do.	21	Present.
21	Present.	24	Do.			24	Do.
24	Do.	26	Do.			26	Do.

These were apparently all cases of ordinary typhoid fever, neither very mild nor very severe. The disappearance or lightening of the reaction about the latter part of the third week in certain cases in which its first appearance had been delayed has been noted in other cases reported from the laboratory. (See Philadelphia Medical Journal, March 26, 1898.)

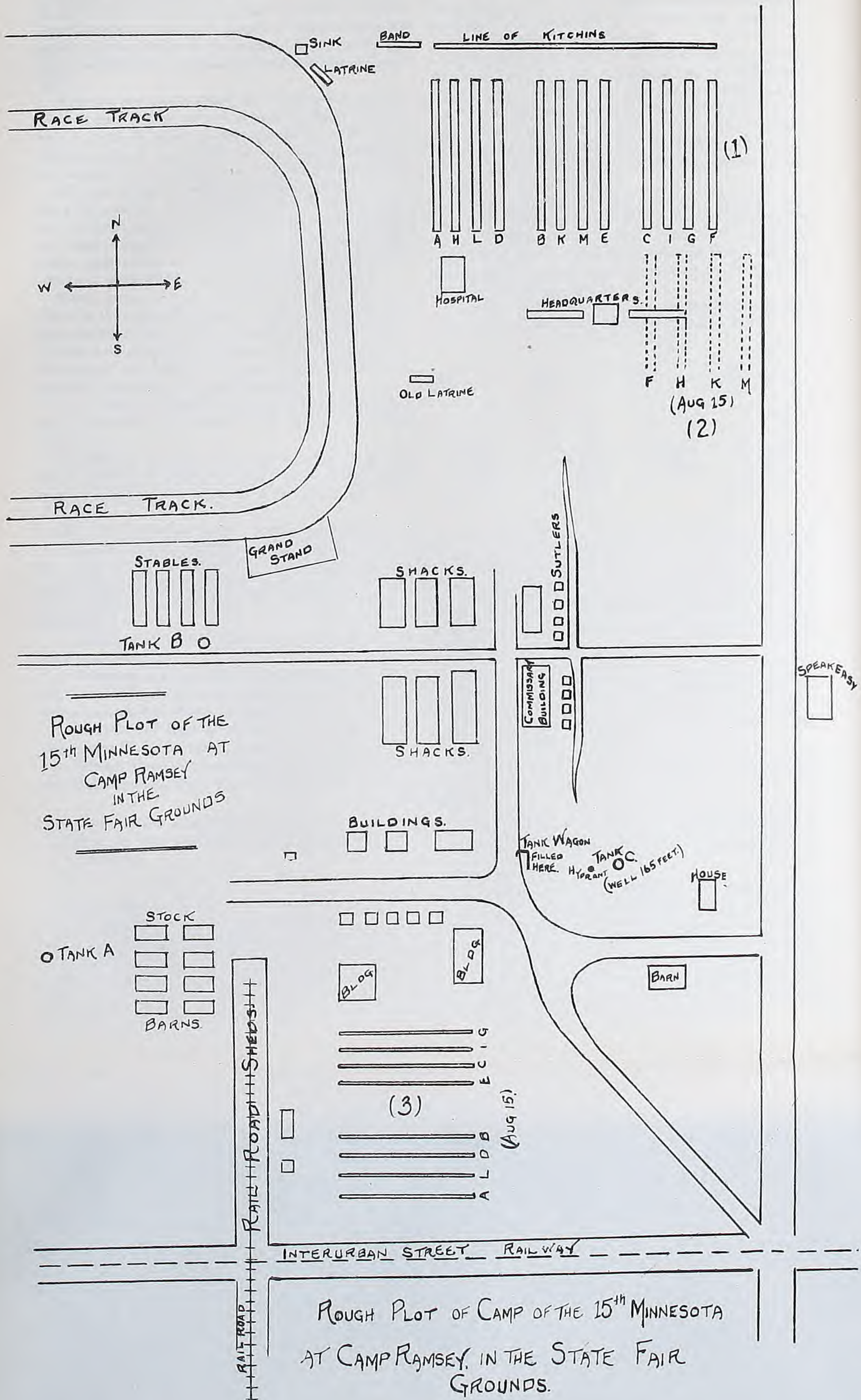
Of the 58 cases on which the clinical data have been received, 56 were diagnosed clinically typhoid fever. All these gave the Widal reaction one or more times. One was clinically diagnosed as "convalescent" from typhoid and gave no reaction.

The urine in 49 of the 58 cases showed the diazo reaction; in 5 it was noted as "absent," and in 2 "not tested."

The overworked condition of the staffs of the various hospitals made it impossible for them to collect urine or other excreta with aseptic precautions for bacteriological investigation.

The workers in the laboratory were altogether too few to study to the best advantage the material most readily collected, and by reason of the sickness of the executive officer of the board, in addition to the ordinary duties, they were called upon to visit the camps and make suggestions as to isolation, disinfection, etc. Consequently the contemplated examination of various excreta from the patients was not undertaken.

PASTURE



The bacillus isolated from the bodies of flies caught at the mess tents of Company H, so far as morphological and cultural appearances go, is not to be distinguished from known typhoid bacilli. But it does not react to known typhoid blood even of most intense reactionary power, and it is so feebly pathogenic to guinea pigs as to leave doubts of the animals having died from the inoculation at all, more especially since the organism has not been recovered at autopsy. The source of this organism, either within or upon the bodies of flies, is such an unknown factor as influencing its bacteriological characteristics that the problem is still unsolved. Efforts are still being made, by the use of various culture media, etc., to increase the virulence of the germ, and if possible also to restore—on the assumption that it has been lost—its reactionary power to typhoid blood. Such a problem must necessarily be slow of solution, but it is well worth the labor which has been and must still be expended upon it.

It must be remembered, however, that a negative result in this and in other examinations of materials from the camp does not exclude a sink-to-soldier infection. The origin of the first cases will probably never be accurately determined, though facts stated in the laboratory report at the last quarterly meeting of this board would seem to indicate the probable source to have been individual infection in the city of Minneapolis. But the ocular evidence of the probability of infection from the sinks after their contamination was so strong at the times they were inspected by the bacteriologists from the laboratory that the wonder was how any who used them for purposes of defecation could escape infection. Feces and urine were deposited by the men on many objects with which afterwards the hands or clothing of other men came in contact. Flies were abundant and must have distributed fecal material and bacteria over all the rails, etc., of the sinks (probably also to food, etc., at the mess tents). A plan that would have kept the places free from danger would have covered or disinfected immediately after excretion all feces and urine. This was practically impossible with the men unused as they were to discipline. An effort was made to do so at the sinks, but it was so imperfectly carried out as to leave innumerable opportunities for infection.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FIFTEENTH MINNESOTA VOLUNTEER INFANTRY.

Brief outline of the medical history.—Responding to the second call for volunteers, the Fifteenth Minnesota assembled at Camp Ramsey, the State camp, in the fair grounds near St. Paul, Minn., the first companies arriving there on the 5th of July, 1898. The regiment went into camp to the east of the race track (see 1. general sketch map of Camp Ramsey) on ground which had been previously occupied by the Twelfth Minnesota, a first-call regiment, which had assembled here the latter part of April and departed for the

national camp at Chickamauga about the 16th of May. The Fifteenth Minnesota remained on this camp site until the 15th of August, when, in consequence of a sharp outbreak of typhoid fever among four companies, the eight apparently unaffected companies were removed to much higher ground (see No. 3 on the above-mentioned map), while the four affected companies were shifted to new ground (see No. 2 in map) very near the first site. The respective companies remained thus encamped upon their new sites until the 23d of August, when, because of the development of the epidemic among the eight companies originally unaffected encamped at site No. 3 in the map and of the continued spread of the disease among the four first affected companies on site No. 2 in the map the regiment marched about 6 miles to the Government reservation at Fort Snelling and went into camp there. Here also, as a precaution, the four first affected companies were at first kept widely apart from the other companies; but it was soon found that these other companies were now suffering quite as much, if not indeed more so than the first four, and at the end of a week after moving to Fort Snelling the latter joined the camp of the eight companies. Attention should be called to the fact that when the regiment moved to Fort Snelling Company G—at that time the only company apparently unaffected—was left behind at Camp Ramsey for a day, in order to police the abandoned camp sites. The regiment now remained encamped without further change at Fort Snelling until the 15th of September, when it departed by rail for the national camp in Pennsylvania. After having been already quite extensively ravaged by an epidemic of typhoid fever, which had developed in its State camp, the Fifteenth Minnesota arrived at Camp Meade, the national camp in Pennsylvania, on the 18th of September, was assigned to the Third Brigade, First Division, of the Second Army Corps, and went into camp on high, rolling, well-drained ground. (The other regiments of this brigade were the Eighth, Twelfth, and Thirteenth Pennsylvania, all from Camp Alger, Va., the Twelfth being temporarily attached under orders to be mustered out. See histories of these regiments under Camp Alger.) The Fifteenth Minnesota remained in Camp Meade without change until the 16th of November, when it took train for Camp McKenzie, near Augusta, Ga., arriving at the latter camp on the 18th. The regiment was still in this camp on December 31, 1898, and it was there when mustered out of the service of the United States on March 27, 1899.

The medical history as prepared by the board therefore covers a period of five months and twenty-six days. Of this time, forty-nine days were spent in Camp Ramsey, the State camp, near St. Paul, Minn., forty-one of these upon the first camp site and eight upon the second site; twenty-three days encamped upon the Government reservation at Fort Snelling, Minn.; fifty-nine days at Camp Meade, the national camp in Penn-

sylvania; thirty-three days in Camp McKenzie, the national camp near Augusta, Ga.

This regiment furnishes a most striking example of rapid prostration by the ravages of typhoid fever before arrival in the national camp of rendezvous. Nearly the whole of its exceedingly extensive infection occurred before its arrival at Camp Meade, Pa. Indeed, there was scarcely any new typhoid infection after arrival there, for nearly all of the comparatively few cases developed in Camp Meade were undoubtedly infected before arrival there. This great epidemic was therefore practically extinguished before the departure of the regiment from the national camp in Pennsylvania for the national camp in the South.

With respect to the origin of this extraordinary epidemic, besides what has already been advanced in the foregoing communications it may be well to know something of the early history of the Twelfth and Fourteenth Minnesota regiments of the first call, which preceded the Fifteenth Minnesota at Camp Ramsey, the Twelfth Minnesota, as already stated, having previously occupied the same camp site. Although the respective surgeons of these two regiments do not admit the existence of typhoid fever while at Camp Ramsey, the details of the medical histories of these two regiments as obtained by the board indicate that both the Twelfth and the Fourteenth Minnesota regiments arrived at the national camps in Chickamauga Park already infected with typhoid fever. (See their histories under "Chickamauga Park.")

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates given of the beginning of attacks were recorded as closely as they could be ascertained:

[Fifteenth Minnesota Volunteer Infantry; mean strength, 1,280.]

Month.	Intestinal disorders.				Febrile attacks.		Typhoid attacks.		Total probable typhoid, including long malaria.	Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.		Typhoid.	All other.
July.....	67	2	1	70	.....	.....	.....	1	1	.....	.....
August.....	140	21	2	163	.....	.....	17	270	287	.....	.....
September.....	62	10	3	75	23	2	22	136	160	5	.....
October.....	43	8	4	55	65	6	7	6	19	11	.....
November.....	12	3	2	17	44	5	2	1	8	2	.....
December.....	8	6	.....	14	14	1	.....	1	2	.....	.....
Total.....	332	50	12	394	146	14	48	415	477	18	.....

A rectification of the total number of so-called long malarias as given in the above summary table should be made by reducing the total of 14 to 12, thus requiring a corresponding reduction of the number of probable typhoid-fever attacks from 477 to 475.

The above tabulated deaths from disease, by months, were distributed among the companies as follows:

	Company.								Total.
	E.	F.	G.	H.	I.	K.	L.	M.	
Typhoid	2	1	6	3	1	1	1	3	18

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (a) who have had no other recorded attacks (of the categories we have been considering) and (b) who have had such other attacks:

Intestinal disorders in the Fifteenth Minnesota.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea.....	21	9	19	17	19	14	2	10	20	14	5	20	.....	170
Two attacks short diarrhea.....	2	6	6	5	4	1	.....	1	3	4	3	2	.....	37
Short and long diarrhea.....	.....	.....	.....	1	.....	.....	.....	.....	2	1	1	.....	.....	5
Short and prolonged diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1
Single long diarrhea.....	2	1	1	5	1	1	2	1	1	1	1	.....	.....	18
Two attacks long diarrhea.....	.....	2	.....	.....	1	.....	.....	.....	.....	2	2	.....	.....	5
Prolonged diarrhea.....	.....	.....	.....	1	.....	.....	.....	.....	.....	2	1	1	.....	6
Prolonged and long diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1
Total diarrhea.....	37	41	39	41	39	22	15	22	34	40	17	46	1	394

Totals include diarrhea in malaria and typhoid combinations.

Combinations of continued or malarial fever in the Fifteenth Minnesota.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	7	10	9	8	11	9	13	5	10	10	3	8	.....	103
Short malaria preceded by diarrhea.....	1	2	1	1	2	.....	2	4	2	.....	1	.....	.....	16
Long malaria (uncombined).....	.....	.....	4	1	.....	.....	1	2	.....	.....	1	.....	.....	9
Long malaria preceded by diarrhea.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	3
Two attacks long malaria preceded by diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Total short malaria.....	8	16	13	9	14	12	21	13	13	13	4	10	.....	146
Total long malaria.....	2	1	4	1	.....	.....	1	1	2	.....	2	.....	.....	14

Totals include malaria in typhoid combinations.

Combinations of typhoid fever in the Fifteenth Minnesota.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	21	23	7	24	20	34	41	48	21	36	20	25	2	322
Probable typhoid (uncombined).....	3	2	2	3	3	3	2	2	1	2	5	8	.....	36
Typhoid beginning in diarrhea.....	2	.....	1	1	2	1	2	3	1	.....	.....	.....	.....	13
Probable typhoid beginning in diarrhea.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Typhoid preceded by diarrhea.....	6	6	2	1	5	3	7	4	2	6	1	6	.....	49
Probable typhoid preceded by diarrhea.....	.....	1	1	2	.....	1	1	1	1	.....	1	.....	.....	9
Typhoid followed by diarrhea.....	.....	.....	1	1	1	.....	.....	.....	3	.....	1	.....	.....	7
Typhoid preceded by malaria.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1
Typhoid followed by malaria.....	2	2	.....	.....	1	1	5	4	1	1	.....	2	.....	19
Probable typhoid followed by malaria.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Combinations of three diseases.....	.....	.....	1	.....	.....	1	1	.....	.....	.....	2	.....	.....	5
Total certain typhoid.....	29	31	14	27	29	40	56	59	25	46	21	36	2	415
Total probable typhoid.....	3	3	3	5	3	5	4	3	2	2	5	9	1	48
Total probable and certain typhoid.....	32	34	17	32	32	45	60	62	27	48	26	45	3	463

The records of sickness in this regiment were found to be more or less incomplete and to some extent conflicting. By way of illustration: There are 14 names of soldiers in this regiment in the hospital records which were not found in the regimental sick reports; and, vice versa, there are 7 names of soldiers entered upon the regimental records as having been sent to the division hospital which have not been discovered in the reports of the latter. Furthermore, there are 9 cases of so-called short malaria of which there are no final dispositions recorded. How many of these were really typhoid fever and should have been added to the total number of probable typhoid-fever attacks given in the above summary table we could not determine. That there were some we think can not be reasonably questioned. Moreover, we have encountered 2 fatal cases of typhoid fever of which the only record of sickness found was the death return to the Adjutant-General's Office. The foregoing tabular statement of sickness should be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Fifteenth Minnesota Volunteer Infantry as a member of the Third Brigade and First Division of the Second Army Corps, as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(a) The regiment was in its State camp, in the fair grounds near St. Paul, Minn., from July 5 to August 23, having changed camp site August 15; it was on the Government reservation at Fort Snelling from August 23 to September 15; it was in Camp Meade, the national camp in Pennsylvania, from September 18 to November 16; it was in the national camp near Augusta, Ga., from the 18th of November until the 31st of December, 1898, and it was mustered out at the latter place March 27, 1899. The initial date of the first probable attack of typhoid fever was August 3; of the first certain attack of typhoid fever was July 30. A quite sudden outbreak of typhoid fever, at first limited to certain companies, occurred at the State camp. This caused, first, a change of camp site, and, soon after, the removal of the regiment from the State fair grounds, near St. Paul, to Fort Snelling, but the epidemic assumed still larger proportions for a while. Although by the date of the departure of the regiment for the national camp in Pennsylvania this epidemic had already begun to rapidly decline, it carried with it the infection, very widely diffused among the companies. The medical history, as given by the board, covers a period of five months and twenty-six days (from July 5 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorder, 394; of so-called short malarias, etc., 146; of so-called long malarias, etc., 12; of probable typhoid fever, 48, and of certain typhoid fever, 415. Total attacks of probable typhoid fever (long malaria, etc., included), 475.

(c) Total deaths from typhoid fever, 18; total deaths from all diseases, 18; mortality per cent of total probable typhoid fever attacks, 3.78; of total certain typhoid fever attacks, 4.33; per cent of total typhoid deaths to total deaths from all diseases, 100.

(d) The mean strength was 1,280. The per cent of typhoid morbidity to mean strength as to total probable typhoid fever attacks was 37.10, while the average for the division was 22.57; as to total certain typhoid fever attacks was 32.42, while the average for the division was 15.42. The number of typhoid deaths per 1,000 of mean strength was 14.06; the average for the division was 12.55.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Fifteenth Minnesota:

Disease.	Individuals.	Average age.
Short intestinal disorders	201	25.8
Long intestinal disorders	22	25.2
Prolonged intestinal disorders	9	21.8
Total intestinal disorders	232	25.5
Short malaria, etc.	60	25.5
Long malaria, etc.	14	20.9
Probable and certain typhoid attacks.....	444	24.0
Total probable and certain typhoid and long malaria.	458	23.9
Grand total of all above classes	750	24.4
Eleven soldiers who died from typhoid fever		24.8

For comparison of these average age figures with similar data relative to other regiments in this division we refer to the general tables treating of this subject at the end of the Second Army Corps at Camp Meade, Pa. (See also similar tables relating to the regiments of the Second Division of the Seventh Army Corps at Jacksonville, Fla.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

The history of typhoid fever among the companies of this organization furnishes more numerous examples of the exceptions to the general rules frequently enunciated than does any other regiment in the whole Volunteer Army which has been studied by the board from the standpoint above mentioned. This is due no doubt to the fact, as shown by the foregoing history of disease in this regiment, that at least four of the companies, H, M, K, and F, of the Fifteenth Minnesota, inaugurated the experience of the regiment with typhoid fever by sudden and nearly simultaneous epidemic outbreaks of the disease. Reference to the accompanying diagram maps of the camps of this regiment shows that these companies, however, were in separate battalions, only two of them being adjoining companies in the middle battalion. And even in these four companies which had a synchronous beginning the subsequent course of the disease was dissimilar. While with the

four companies mentioned we may assume that there was a common origin of the epidemics, we can not infer the existence of a common, simultaneous, and more or less continuously acting agency as the chief means of propagation even in these epidemics. And as to the other companies in this regiment, the dissimilarities in the time of beginning and the course of the company epidemics as well as their ending would appear to be incompatible with the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means of origin and propagation of typhoid fever. Reference to the graphic chart gives ample evidence of these truths, and it is not necessary to illustrate further by entering into details.

(b) The company epidemics have frequent greater or less exacerbations in their course; and the intervals between these exacerbations are as a rule closely coincident with the average period of incubation of typhoid fever. A close examination from this standpoint of the foregoing tabular statement and of the graphic chart will more or less definitely substantiate this statement.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) Reference to our first diagram map, representing the first camp of the Fifteenth Minnesota at Camp Ramsey, in the fair grounds near St. Paul, Minn., in which we have indicated the order and relation of the different companies of this camp, as well as the number of attacks of typhoid fever in the various tents, will show that the four companies, H, K, M, and F, which experienced almost simultaneously the first sudden outbreak of typhoid fever, were distributed among the three battalions, only two of them, K and M, adjoining each other in the center battalion, while Company F was on the extreme eastern flank of the regiment and Company H was the company next to the extreme western flank. With reference to the location of the regimental latrine, it is seen that there is a great diversity in the location of these four first affected companies. Since there was only one large regimental latrine for the use of all companies in this camp, mere reference to the relative location of these companies in the regimental camp and the location of the latrine some distance from the extreme western flank of the camp would appear to be sufficient to cast in doubt any common agency of wind or flies playing a chief rôle in the origin or dissemination of the infection of typhoid fever throughout these companies, since neighboring or intervening companies of the battalions did not participate in a common experience.

(b) Attention is called to the fact that when the regiment departed from Camp Ramsey, in the fair grounds, on the 23d of August, Company G was left behind for one day to police the abandoned camps, this company up to that time having been entirely free from serious disease. The first outbreak in this company was a

severe one, occurring on the 25th of August, followed by a continuance of the severe epidemic for three weeks or more. It may be remarked here that this company was not mustered in until July 16.

(c) It may also be remarked that when, on the 15th of August, owing to the serious spread of typhoid fever, the first camp of the regiment was abandoned, the four severely affected companies, K, M, F, and H, were moved to new and higher ground near the first camp; the other companies, at this time little affected, were moved to a new site at a considerable distance on new and high ground, still within the fair grounds near St. Paul. When, on August 23, the regiment was moved from Camp Ramsey to Fort Snelling, Minn., the badly affected companies, K, M, F, and H, were placed in an isolation camp some 2 miles from the general camp at Fort Snelling for about six days, after which time they joined the camp of the regiment, because of the fact that the infection had by that time become very generally disseminated among the other companies.

SPECIAL CHARACTERISTICS OF CERTAIN COMPANY EPIDEMICS AS EXHIBITED BY GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN TENTS, VIEWED FROM THE STANDPOINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) We have endeavored to ascertain the names of soldiers as they were grouped in their tents during the periods of the encampment of this regiment at the State fair grounds near St. Paul and at Fort Snelling, Minn., as well as at Camp Meade, Pa., in order to examine into this important question. To this end we have requested such data from two different sources, namely, from the regimental surgeon and from the commanding officers of companies. The regimental surgeon in response to this request furnished a diagram map of the camps of the Fifteenth Minnesota, in which the number of attacks of typhoid fever in individual tents of companies was indicated. He also furnished a list of names of the men of each company as they were grouped together in their tents. With the data thus obtained we have constructed two diagram maps showing the order and relationship of the companies in their camps and the number of cases of typhoid fever which developed during four different periods. In the first map the attacks of typhoid fever up to the 15th of August, when the regiment first changed its camp, are indicated by one sign; those occurring from the 16th to the 23d of August, on which latter date the regiment moved from the State fair grounds to Fort Snelling, by another sign. In the second map the attacks of typhoid fever in two periods are represented, one sign representing the period during which the regiment was encamped at Fort Snelling and the other sign representing the last period, beginning when the regiment reached the national camp, Camp Meade, Pa., September 18. Refer-

ence to these maps shows the manner in which the attacks of typhoid fever were grouped with regard to certain tents. The squad groups of the sick as platted in their tents would seem to be incompatible with the assumption that the chief factor in the propagation of typhoid fever throughout the companies of this regiment may have been some agency whose influence was common and pretty constantly acting upon the whole command; on the contrary, they would appear to suggest a mode of disseminating infection which more effectively reached and acted upon certain limited groups of men while it passed by others, which would be entirely compatible with the assumption of a dominating tent, squad, or comrade infection. Whatever the origin of the epidemic might be, whether a water infection, for example, which acted upon four companies simultaneously and not upon other companies of the regiment, in the course of the subsequent epidemic some other mode of infection became dominant sooner or later and gave rise to dissimilarities even in those companies where the original infection may have been simultaneous.

(b) A further indication of the existence and active influence of a tent, squad, or comrade infection throughout this command is the following result of a careful analysis we have made of the records of sickness in this regiment in connection with the grouping of infected men in their tents and the average time elapsing between successive or "connectable" attacks in the same tent and in adjoining tents. As deduced from the surgeon's tent lists, we find that among 436 cases of typhoid fever platted in their respective tents 317, or 72.70 per cent, were separated or "connectable" by periods which could fairly be regarded as measuring the average period of incubation of typhoid fever.

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation of this disease from data obtained from two different sources, and we have found a striking coincidence in the average of the figures thus obtained:

(a) Period of incubation as deduced from the length of intervals between "connectable" attacks of typhoid fever occurring in the same or in adjoining tents. As deduced from the surgeon's tent lists, among 436 attacks of typhoid fever spotted in their respective tents there were 214 intervals between attacks which could fairly be regarded as measuring the length of an average period of incubation. The average length of these 214 intervals was 10.2 days.

(b) Period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid fever attacks. The Fifteenth Minnesota furnished 26

examples of attacks of diarrhea preceding typhoid fever by periods which could fairly be regarded as measuring a period of incubation. The length of the intervals in these cases averaged 11.7 days.

For similar data concerning other regiments of this corps and of the regiments of the Second Division, Seventh Army Corps, see tables relating to this subject under the respective corps.

AVERAGE LENGTH OF DISABILITY FROM TYPHOID FEVER.

The fullness and the completeness of the records concerning typhoid fever in the Fifteenth Minnesota furnished an opportunity for an endeavor to ascertain the average length of disability from typhoid fever in a military command in active service in the field. An analysis of 326 cases, of which the records were complete—that is, the lapse of time between the recorded beginning of the attack and the date of return to duty—shows the average to be sixty-eight days. These 326 cases were distributed as follows: First class comprised 179 attacks occurring anterior to the 25th of August (ten days after the removal of the regiment from its first camp site); the average disability in this class was seventy days. Second class, attacks occurring between August 26 and September 3 (ten days, respectively, after the commencement and end of the second camp at Camp Ramsey); 77 attacks occurred during this period, which averaged sixty-four days of disability. Third class, September 4 to September 29 (ten days, respectively, after the commencement and end of the regiment's encampment at Fort Snelling); this period embraced 66 attacks of typhoid fever, whose average disability was sixty-seven days each. Fourth class, after September 29 (ten days after the arrival of the regiment at the national camp at Camp Meade); this period embraced 4 cases, whose disability averaged each forty-two days. It is thus seen that the length of average disability was much shorter in those cases infected in the national camp than in the cases infected in the earlier camps. (See also general table relating to this matter under the Second Army Corps at Camp Meade.)

In this regiment, the Fifteenth Minnesota, the average length of disability caused by typhoid attacks was ascertained in 326 cases. These cases are considered under four groups or classes, viz:

1. Attacks which occurred before August 25.....	179
2. Attacks which occurred from August 26 to September 3....	77
3. Attacks which occurred from September 4 to September 29....	66
4. Attacks which occurred after September 29.....	4
Total	326
The average disability—	Days.
In group 1	70
In group 2	64
In group 3	67
In group 4	42
In all four groups	68

The instances in which three or more typhoid attacks

occurred in the same tent were 81, distributed in the four groups as follows:

1. Attacks which occurred before August 25.....	42
2. Attacks which occurred from August 26 to September 3 ..	22
3. Attacks which occurred from September 14 to September 29 ..	15
4. Attacks which occurred after September 29.....	2

Total 81

The average disability—

Days.

In group 1	70
In group 2	67
In group 3	69
In group 4	46
In all four groups	68

Table showing average length of disability from typhoid fever as deduced from attacks whose duration has been recorded.

[Fifteenth Minnesota Volunteer Infantry, Second Army Corps.]

Class.	Total of typhoid attacks.	Average days of disability.	Three or more typhoid attacks in same tent.	Average days of disability.	Two or more typhoid attacks in same tent.	Average days of disability.
First class (before August 25).....	179	70	42	70	.....	.....
Second class (Aug. 26-Sept. 3).....	77	64	22	67	.....	.....
Third class (Sept. 4-29)	66	67	15	69	.....	.....
Fourth class (after Sept. 29).....	4	42	2	46	.....	.....
Total	326	68	81	68	213	70

In addition to the foregoing regiments, the following organizations belong to the First Division, viz: Seventh Ohio Infantry, Eighth Pennsylvania Infantry, Twelfth Pennsylvania Infantry, Thirteenth Pennsylvania Infantry, First Rhode Island Infantry, and Second Tennessee Infantry. (See histories of these regiments under Second Army Corps, at Camp Alger, Va.)

FOURTH NEW JERSEY VOLUNTEER INFANTRY.

First Brigade, Second Division, Second Army Corps, Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. Edwin Field, surgeon.]

State encampment, Seagirt, N. J.—The regiment was mustered in on July 19 at Seagirt, N. J., and remained in camp at that place until the night of October 8. This camping ground has been used by the New Jersey National Guard in the summer for at least eight or nine years.

An artesian well, 350 feet deep, supplies the water for the encampment, which has proved wholesome. There is a large reservoir tank, from which this water is distributed to the companies through underground iron pipes, so that the water in them is not affected by the direct rays of the sun nor by the hot superficial layers of the earth. The water is cool enough, so that no ice is used in it. Hydrants are placed at the ends of the company streets near the kitchens. The water is abundant for a brigade, but would not be sufficient for a division.

The kitchen garbage is kept in barrels, removed twice daily, and placed in a sink, where it is limed and covered with earth.

The disposal of excrement has been at Seagirt as follows: There are the ordinary dug pits, but not more than 4 feet deep, on account of the danger of striking water at the bottom. We used a regimental latrine. In the summer season, during the National Guard encampments here, one regiment would succeed another in the occupancy of these grounds for a week at a time. During the time of encampment by each National Guard regiment the fecal matter was covered with lime and then with earth, and after the abandonment of the camp at the end of the week the contents of the sink would be removed. In this manner the pits would be used over and over again by succeeding organizations of the National Guard. When the Fourth New Jersey came to Seagirt it had battalion latrines, and used them for about a month in the manner above mentioned. At the end of about a month these sinks were replaced by tight wooden boxes for the reception of feces. These boxes were limed four times a day and emptied every night, the contents being hauled off to a distance. It was the odor from the accumulations in the original battalion sinks and the flies swarming there which caused their abandonment and the resort to the boxes. "We were bothered greatly with flies in the kitchens and mess tents." The sinks were about 150 feet or more distant from the mess tents. The only sewers in existence were those to dispose of the overflow water from the hydrants. Heavy rainfalls would be quickly absorbed by the light, loamy, sandy soil, the surface of which is almost level, but there is a slight declivity toward the small inland lake toward the southern part of this encampment. The sewer above mentioned for the hydrants got obstructed at one time, and it had to be repaired. For these repairs the tiles furnished for the State were long delayed in coming, so that this sewer was left open for ten days. "About two and a half or three days after this there were 3 cases of remittent fever developed. One of these cases was in the engineer who had charge of this work. This man, however, came from a malarial region."

During the warm season the men were required to bathe between 3 and 4 p. m. in the ocean. After it got too cold for the ocean bathing a large mess hall was fitted up with bath tubs in one end thereof, and all of the men returning from guard duty were required to bathe under the direct supervision of an officer.

The First New Jersey returned to Seagirt from Camp Alger about the end of August (the last or next to the last Saturday in August). They brought 20 cases of fever with them, 12 of these being typhoid. These cases were kept in a new hospital in the camp until about the 1st of October, and they were attended by Red Cross nurses. The camp of the First New Jersey was separated from that of the Fourth New Jersey by a regimental space, but the hospital above named (the large mess hall before mentioned converted for the purpose) was just to the rear of the officers' quarters of the Fourth New Jersey. It should also be

noted that, as already stated, one end of this large mess hall had previously been used and continued to be used for bathing of the guard details of the Fourth New Jersey. The association of the men of the Fourth with those of the First and of the Second New Jersey (which latter had also returned seriously infected with typhoid fever from Jacksonville, Fla.) was pretty constant and close and could not be controlled.

The Second New Jersey returned to Seagirt about the end of the third week in September, having left in Florida 70 cases of typhoid fever, and having brought with them about 60 cases, which latter were sent directly to Orange and Paterson, N. J., none being kept in Seagirt. The camp of the Second New Jersey directly adjoined that of the Fourth New Jersey, and was east of the latter. The Second New Jersey developed 3 cases of typhoid fever within a week after their return, and for a few days these cases were cared for in the regimental hospital of the Fourth New Jersey.

The Fourth New Jersey had only a few cases of remittent fever and some diarrheas in the first week of their encampment at Seagirt. They suffered no epidemic of measles, mumps, etc. There was one case of scarlet fever, which was sent out of camp to the hospital at Longbranch. This hospital at Longbranch was the one to which cases of illness in the Fourth New Jersey were usually sent, the men not being retained in the regimental hospital, which, in fact, did not exist.

Camp Meade, Pa.—The Fourth New Jersey arrived at Camp Meade, Pa., on October 9. Since reaching Camp Meade the command has been supplied with 11 Maignen and Berkefeld filters, which are not thought much of by the surgeon and officers. They prefer to use, and are now using, boiled water. The use of boiled water is strictly enforced. All the men in camp are drinking it solely.

The Second Battalion (Companies I, A, C, and B) has been on provost duty in and around Middletown, Pa., for a week, and they are still out on this duty, their tour being twenty-one days. (This testimony was taken November 2, 1898.)

Two days after arriving at Camp Meade 1 case of typhoid fever developed from Company H. The next typhoid fever case came from Company B, developed on the 26th of October. Only 2 cases of typhoid fever have been sent to the hospital. Seven other cases have been sent there, suffering variously with pneumonia, venereal diseases, and gunshot wounds. The health of the command since arriving at Camp Meade has been excellent.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE FOURTH NEW JERSEY VOLUNTEER INFANTRY.

Camp Meade, Pa.—Capt. Jacob M. Coward, commanding Company A, furnished a list of his men grouped in their tents as at Camp Meade, and stated substantially as follows: The companies of the regiment

were arranged from right to left as follows (the number and order of battalions not stated): E, M, H, F; I, A, C, B; L, G, K, D.

This company was with the Second Battalion on detached service as provost guard at Middletown, Pa., near Camp Meade, October 22 to November 11.

The company was chiefly from cities and towns. The men were of medium intelligence and were reasonably prudent as to personal conduct. The financial status of the company was about the average of the rest of the regiment. No case of typhoid fever occurred in this company nor in the regiment to which it belonged. This is due to the great care of the commanding officer concerning sanitary matters, in substantiation of which I would refer you to reports of brigade surgeons.

Capt. Harry J. Ralph, commanding Company D, stated substantially as follows: The companies of the regiment were arranged in battalions at Camp Meade as follows: First Battalion, E, M, F, H; Second Battalion, I, C, A, B; Third Battalion, L, K, G, D.

This company was on detached service but once, and that was while the regiment was at Camp Wetherill, S. C.

The company came chiefly from an urban population and its intelligence was medium. The men were reasonably prudent as to personal conduct and habits affecting their health. Their financial status was below the average.

We had but one case of typhoid fever in my company. I think the soldier contracted the disease at Camp Alger, from which camp he was transferred to my company while we were at Camp Meade, Pa.

Capt. C. W. Barber, commanding Company H, furnished a list of his men grouped in tents as at Camp Wetherill, Greenville, S. C., from November 15, 1898, to April 6, 1899, and stated substantially as follows: In this camp all the tents of the company faced in one direction (southeast), the rear of the tents of the next company forming one side of each company street. The tents of the men were arranged in groups of three, one behind the other, the middle seam in the back of the first and second tents being ripped and rolled back so as to form one large tent out of the three thus combined. These groups of three tents were set on a platform 21 feet by 8 feet 4 inches, the floor being tongued and grooved, resting on a frame of material 3 by 4 inches with an 8-inch baseboard five-eighths of an inch thick all around the edges. A hole 2 feet 6 inches square was made in the center of the floors upon which was set a box frame 3 feet square and 8 inches high filled with clay. Upon the clay contents of this box an ordinary Sibley military stove was placed. In the middle tent the seam nearest the rear was ripped near the ridgepole sufficient to furnish an outlet for the stove-pipe, around which two tin covers and shields for the canvas were riveted fast, one inside and one outside, being careful to keep the inner edge of the canvas outside of the rivets.

At Camp Wetherill, Greenville, S. C., the companies were arranged from right to left as follows: First Battalion, E, M, H, F; Second Battalion, I, A, G, B; Third Battalion, L, C, D, K.

The only special duty this company did was with the First Battalion as provost guard in the city of Greenville, S. C., in the month of January, 1899.

This company was largely from a rural population, but not exclusively so. The average intelligence of the men was high. Their conduct and habits affecting their health were medium, and the financial status of the men was slightly above the average:

There was but 1 case of typhoid fever in this company during the entire service of nine months. This man was treated in the regimental and division hospital (Second Division, Second Army Corps), and also in a civil hospital in Philadelphia, where he was sent from Camp Meade, Pa. After a furlough he was completely restored to health, and was mustered out April 6, 1899, as "absolutely sound."

Probably throughout the entire regiment of the Fourth New Jersey Volunteers the health record is quite as good. I know that there were 2 deaths from disease or natural causes, one of them being the result of an organic affection, for which the service was not in any way responsible.

I attribute this excellent state of health to the great care and excellent judgment shown by the commanding officer of the regiment in the most minute details affecting the sanitary conditions of his command, exacting at all times from his officers, and particularly company commanders, the same carefulness and vigilance, especially in the preparation of and the serving of their food; in personal cleanliness: in clean, dry, and airy bedding (which never exceeded blankets and bed sacks filled with straw), and in daily policing of a thorough character.

In fact, the full exercise of that knowledge gained throughout a service beginning at West Point and extending over twenty-five years in the Regular Army is, I believe, responsible for the good-health record made by this regiment. Colonel Gilmore personally instructed the officers of the regiment, and then demanded and received from them the most explicit obedience of his orders, based on long experience.

Capt. Alvin H. Graff, commanding Company M, furnished a list of men grouped in tents as at Camp Meade, Pa., and stated substantially as follows: The companies were grouped in battalions as follows: First Battalion, E, M, H, F; Second Battalion, I, A, C, B; Third Battalion, L, G, D, K.

This company was not on detached service at Camp Meade.

The company was from an urban population. Its intelligence was medium. The men were rather reckless unless restrained. Their financial status was rather below the average.

The company had no cases of typhoid fever while at Camp Meade. I know of no reason why they especially escaped. I might add that I was not in command at Camp Meade and did not assume command until after the regiment arrived in Greenville, S. C. The health of the company was always good. Only one man was lost, by accident.

ABSTRACTS OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

July.—(Camp Voorhees, Sea Girt, N. J.) Mean strength averaged for — days: Officers, 51; enlisted men, 1,276; total, 1,327. Admissions from command, 56; total to account for, 56. Of 49 completed cases, all returned to duty. Remaining on sick report, 6.

Remarks by Edwin Field, major and surgeon:

Camp Voorhees, Sea Girt, N. J., was occupied by the Fourth New Jersey Volunteer Infantry on July 19. The prevalence of acute diarrhea was owing to carelessness on the part of the men. Water was supplied from artesian wells to all parts of the camp, and waste water from hydrants properly sewered.

August.—(Camp Voorhees, Sea Girt, N. J.) Mean strength averaged for 31 days: Officers, 51; enlisted men, 1,278; total, 1,329. Remaining on sick report from last month, 6; admitted from command, 151; total to account for, 157. Of 142 completed cases, 141 returned to duty and 1 was discharged for disability. Remaining on sick report, 15.

Abstract of remarks by Edwin Field, major and surgeon:

Camp Voorhees, Sea Girt, N. J. Nothing of interest occurred during the month.

September.—(Camp Voorhees, Sea Girt, N. J.) Mean strength averaged for thirty days: Officers, 44; enlisted men, 1,147; total, 1,191. Remaining on sick report from last month, 15; admitted from command, 150; total to account for, 165. Of completed cases, 136 returned to duty. Remaining on sick report, 9.

Abstract of remarks by Edwin Field, major and surgeon:

The precaution was taken to remove all garbage twice daily to a distant lot, where it was limed and buried. The latrines were converted into bucket sinks, limed four times daily, and contents removed every night.

The few cases of malarial poisoning were probably owing to the opening of a sewer trench to re-lay the pipes; owing to the delay in procuring the necessary piping the trench was kept open for ten days.

The men bathed in the ocean daily; when it became too cold for ocean bathing a bath was provided and the men compelled to bathe at least once a week by the check system.

October.—(Camp Voorhees, Sea Girt, N. J., and Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 44; enlisted men, 1,110; total, 1,154. Remaining on sick report from last month, 9; admitted from command, 136; total to account for, 145. Of 128 completed cases, 117 returned to duty; 11 were transferred to other hospitals. Remaining on sick report, 17.

Abstract of remarks by Edwin Field, major and surgeon:

Regiment stationed at Camp Voorhees, Sea Girt, N. J., until October 8, thence removed to Camp Meade, Middletown, Pa.

The first case of typhoid fever developed October 12. The First New Jersey Volunteer Infantry returned from Camp Alger about one month before the Fourth New Jersey broke camp at Sea Girt, and established a fever ward in the mess hall 50 feet to the rear of the Fourth New Jersey camp. The First New Jersey had several cases of typhoid fever, one dying while occupying said ward. The men of the two regiments intermingled freely while in camp together. Since October 15, 1 case of typhoid fever developed—October 27.

Camping ground at Camp Meade, Pa., not previously used for camping purposes. Every precaution was taken to insure health. Water filtered and boiled. Latrines lined daily and excrement covered at once. Camp kept clean. No deaths have occurred in regiment.

Second Battalion, under command of Maj. T. S. Chambers, with Asst. Surg. First Lieut. Joel W. Fithian, was detailed for provost duty at Middletown and vicinity October 23.

November.—(Camp Meade, Pa., and Camp Wetherell, S. C.) Mean strength, averaged for thirty days: Officers, 44; enlisted men, 1,152; total, 1,196. Remaining on sick report from last month, 21; admitted from command, 104; total, 125. Of 117 completed cases, 115 returned to duty; 1 was discharged for disability; 1 died. Remaining on sick report, 23.

Abstract of remarks by Edwin Field, major and surgeon:

Regiment stationed at Camp Meade, Pa., November 1 to 12. Second Battalion on provost duty at Middletown, Pa.

Broke camp on the 12th, transported by rail to Camp Wetherell, Greenville, S. C.

Went into camp November 14, 1898, near town, in a cotton field. Water supplied by town authorities, hydrants at head of every other company street. Location good and water supply excellent, good in quality.

Lost 1 man by railroad accident returning to command after over-staying furlough for five days.

December.—(Camp Wetherell, Greenville, S. C.) Mean strength averaged for thirty-one days: Officers, 47; enlisted men, 1,108; total, 1,155. Remaining on sick report from last month, 20; admitted from command, 372; total, 392. Of 379 completed cases, 375 returned to duty; 1 was discharged for disability; 3 were transferred to other hospitals. Remaining on sick report, 13.

Abstract of remarks by Edwin Field, major and surgeon:

Prevailing disease during the month was influenza in the form of la grippe.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FOURTH NEW JERSEY VOLUNTEER INFANTRY.

Brief outline of the medical history.—This is a second-call regiment which assembled and was mustered at the State camp by the shore of the sea, at Sea Girt, N. J., on the 19th of July, 1898, and remained encamped there until the 8th of October, on which latter date it started by rail for the national camp near Middletown, Pa. The next day the command reached Camp

Meade, Pa., was assigned to the First Brigade, Second Division of the Second Army Corps, and went into camp with the Two hundred and third New York and Second West Virginia—the two other members of this brigade, which came direct to Camp Meade from their respective State camps. It should be remarked that the Two hundred and third New York had already been removed to an isolation camp 8 miles away before the arrival of the Fourth New Jersey. (See history of the Two hundred and third New York.) The One hundred and fifty-ninth Indiana, Twenty-second Kansas, Third New York, and Eighteenth Pennsylvania were for a time attached to the same brigade, under orders to be mustered out. (See histories of these regiments under Camp Alger.) The Fourth New Jersey remained at Camp Meade, Pa., until the 12th of November, when it left by rail for Camp Wetherell, near Greenville, S. C., where it arrived on the 14th. It was still in Camp Wetherell on the 31st of December, 1898, and was mustered out of the service of the United States on the 6th of April, 1899, at Greenville, S. C.

The medical history of this regiment, as prepared by the board, covers a period of five months and twelve days. Of this time, eighty-one days were spent in the State camp at Sea Girt, N. J.; thirty-four days at the national camp, near Middletown, Pa.; forty-seven days in Camp Wetherell, near Greenville, S. C.

In his testimony before the board the surgeon in charge of the regiment admits the development of a case of typhoid fever two days after the arrival of the regiment at Camp Meade—the first case of the disease recognized as such by him. This case was, of course, infected some days before arrival of the command at the national camp in Pennsylvania. Moreover, an examination of the following details of sickness in this regiment abstracted from the available records shows that there were four attacks regarded by the board as probably typhoid which developed, respectively, on the 2d, 7th, 24th, and 28th of September. In connection with these four September attacks, it should be remembered that about the last of August the First New Jersey returned to its State camp at Seagirt from Camp Alger, Va., with 20 soldiers suffering from typhoid fever, and that about the 25th of September the Second New Jersey returned to the same State camp from the national camp at Jacksonville, Fla., suffering greatly from typhoid fever and carrying with it, according to the surgeon of the Fourth New Jersey, 60 cases of typhoid fever and leaving behind in Florida as many more sick in hospital. The Second New Jersey adjoined the Fourth New Jersey in the State camp and the men of all three regiments freely intermingled. Prior to the return of the First and Second New Jersey from the respective national camps, where they had become infected with typhoid fever, it is probable that there was no such infection in the State camp at Seagirt—unless, indeed, we may suspect that a case of continued fever developing on the 2d of August in the Fourth New Jersey was really a

typhoid attack rather than of malarial character, as diagnosed by the surgeon. Whether the typhoidal infection certainly existing in the Fourth New Jersey anterior to its arrival at Camp Meade was indirectly chargeable to Camps Alger and Cuba Libre or developed independent of that existent source of infection, this regiment must, in view of the foregoing, be classed with those which have brought from their State camps the infection of typhoid fever. Carrying with it into the national camp the infection of typhoid fever, the Fourth New Jersey presents one of the very few examples in this whole campaign of a regiment having started with the infection, yet escaping the subsequent development of an epidemic of typhoid fever.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for the easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained:

[Fourth New Jersey Volunteer Infantry; mean strength, 1,225.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from diseases.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	All other.
July.....	29	1	.....	30	2	.....	.....	.....	.....	.....
August.....	35	4	.....	39	13	1	.....	.....	1	.....
September.....	45	6	.....	51	5	.....	2	2	4	.....
October.....	39	5	2	46	3	1	1	2	4	.....
November.....	5	1	1	7	3	.....	.....	.....	.....	.....
December.....	19	.....	1	20	.....	.....	.....	.....	.....	.....
Total.....	172	17	4	193	26	2	5	6	13	2

Two "other deaths" in February, 1899. No "typhoid deaths."

There were no deaths from disease in this regiment until the month of February, 1899, and these were not by typhoid fever.

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such other attacks:

Intestinal disorders in the Fourth New Jersey.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea...	12	5	11	21	7	8	21	9	7	14	18	6	.....	139
Two attacks short diarrhea.....	1	1	1	3	.....	2	3	.....	1	1	.....	.....	.....	13
Short and long diarrhea.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	2
Short and prolonged diarrhea.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Single long diarrhea.....	1	.....	1	1	1	1	2	.....	.....	5	.....	.....	.....	12
Long and short diarrhea.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Two attacks long diarrhea.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Single prolonged.....	2	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	3
Total diarrhea.....	19	7	14	28	9	13	38	11	7	16	25	6	.....	193

Totals include diarrhea in combinations with malaria and typhoid.

Combinations of continued or malarial fever in the Fourth New Jersey.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Short malaria (uncombined).....	4	1	...	2	1	3	...	...	5	2	1	...	...	19
Short malaria followed by diarrhea.....	...	...	...	...	...	...	...	2	...	...	...	...	...	2
Five attacks short malaria.....	...	...	...	...	...	...	1	...	...	...	...	...	...	1
Long malaria (uncombined).....	...	...	...	...	...	...	...	...	1	1	...	...	...	2
Total short malaria.....	4	1	...	2	1	3	5	2	5	2	1	...	...	26
Total long malaria.....	...	...	...	...	...	...	...	1	1	...	...	...	...	2

Totals include malaria in typhoid combinations.

Combinations of typhoid fever in the Fourth New Jersey.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined)														
Probable typhoid (uncombined)														
Probable typhoid beginning in diarrhea														
Probable typhoid preceded by diarrhea														
Total certain typhoid														
Total probable typhoid														
Total probable and certain typhoid														

The above tabular statement of sickness in this regiment shows a most extraordinary freedom from typhoid fever. Although 4 cases of typhoid fever appeared in this regiment while yet in its State camp, and the command reached the national camp in Pennsylvania carrying the infection of the disease with it, no epidemic developed.

The salient points of the medical history (including morbidity and mortality) of the Fourth New Jersey Volunteer Infantry, as a member of the First Brigade and Second Division of the Second Army Corps, as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(*a*) The regiment was in its State camp by the seashore, at Seagirt, N. J., from July 19 to October 8; it was in the national camp, Camp Meade, Pa., from October 9 to November 12; it was in the national camp, near Greenville, S. C., from the 14th of November to the 31st of December, 1898, and it was mustered out at the same place April 6, 1899. The initial date of the first attack suspicious of typhoid fever was August 2; of the first certain attack of typhoid fever was September 7. Although, as above stated, the regiment carried with it to the national camp in Pennsylvania the infection of typhoid fever, it experienced no epidemic of this disease. The medical history, as given by the board, covers a period of five months and twelve days (from July 19 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(*b*) Attacks of intestinal disorder, 193; of so-called short malaria, etc., 26; of so-called long malaria, etc., 2; of probable typhoid fever, 5; of certain typhoid fever, 6. Total attacks of probable typhoid fever (long malaria, etc., included), 13.

(c) No deaths from typhoid fever or disease during the period in question.

(d) The mean strength was 1,225. The per cent of typhoid-fever morbidity to mean strength: As to total probable typhoid attacks was 1.06, while the average for the brigade was 21.38; as to total certain typhoid attacks it was 0.48, while the average for the brigade was 14.22. The number of typhoid deaths per 1,000 of mean strength was 0.00, while the average for the brigade was 9.01, and for the division was 8.78.

SECOND WEST VIRGINIA VOLUNTEER INFANTRY.

First Brigade, Second Division, Second Army Corps,
Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. W. B. Henshaw, surgeon.]

Charleston, W. Va.—The regiment was mustered into the service of the United States between June 25 and July 9 at Charleston, W. Va. The camp was on the banks of the Kanawha River. Charleston is located at the junction of the Kanawha and Elk rivers, the latter being a small tributary of the former. The site of the camp was downstream from the city of Charleston, about 2 miles by the course of the river. The sewers of Charleston emptied into the Elk before its junction with the Kanawha, the junction of these two streams being 2 miles upstream from the camp. The city of Charleston is sometimes inundated by the back flow from the sewers. Typhoid fever has often visited Charleston in epidemic form. There was some fever in that city at the time of the encampment. The regiment went into camp at that place, $1\frac{1}{2}$ miles below the city, on fresh ground previously unoccupied. The site of the camp sloped in two directions and the soil was impervious clay with no admixture of stones. The dampness of this site was great, although the general elevation of the ground was about 40 feet above the river.

The sinks were difficult to construct, as sometimes water appeared at the bottom at a depth of only 4 feet; at other times they could be dug 15 or 20 feet without being troubled with water. The pit system of sinks was employed. All excreta was covered with lime, copperas, and earth three times daily. Rains were frequent and the sinks would fill with rain water, but there was no overflowing of feces upon the surrounding ground, although there would be an overflowing of urine at those times. The sinks were more than 300 feet distant from the kitchens. Some of the kitchen garbage was hauled away twice a day by the farmers in the neighborhood, the rest of it, both fluid and solid, was burned [buried?].

The water supply was that of the city of Charleston, the water being brought down in iron pipes to a point near the camp, whence it was hauled in barrels to the

kitchens. This water was used only by the kitchens. The drinking water for the men was brought within the camp in pails by details. (The source of this drinking water is not mentioned, but it is stated in the testimony of the two assistant surgeons as obtained from neighboring springs.) There was no considerable storage of drinking water in the camp. "We boiled and filtered the water only for the sick during that encampment, and we could get no ice. There was little or no raw milk consumed by the men in camp."

There was no sickness among the officers at that camp. The regiment was in this camp until August 19, when it started for Camp Meade, Pa. Fifteen sick men were left behind in the hospital of the city of Charleston, three or four being typhoid. Typhoid fever began to appear in the Charleston camp a week or ten days after the regiment assembled there, and the earliest cases were in men coming from places where typhoid fever had been prevailing. From the time we arrived in the State camp until we left it 6 genuine cases of typhoid fever developed. There were many cases of so-called malaria, which, however, may have been typhoid. There was considerable diarrhea and some dysentery among the enlisted men.

Camp Meade, Pa.—The regiment arrived at Camp Meade, Pa., direct from Charleston, W. Va., on August 20, having left behind in the hospital there 15 cases, as stated.

Major Henshaw got sick five or six days after arriving at Camp Meade and went to the St. Clair Infirmary at Harrisburg and was furloughed from there. He has just returned to his regiment for duty, although he is not yet fit for active service, being still convalescent. He calls his illness malaria. He returned to his regiment on October 20, convalescent. (This testimony was taken November 2, 1898.)

[Lieuts. Z. B. Kalbaugh and W. F. Davley, assistant surgeons.]

Charleston, W. Va.—Lieutenant Kalbaugh has been with the regiment constantly since its muster in, which occurred from June 23 to July 9, 1898, at Camp Atkin, near Charleston, W. Va.

The water supply of Charleston is from the Elk River, which is a tributary of the stream upon which Charleston is situated. There is no public filtration. Whenever it rains the water supplied by the city is very muddy. This water supply is brought in iron pipes to within a half mile of the camp. From thence it is hauled to the camp in barrels. These barrels are kept near the company kitchens. This water standing in the barrels would become warm, and consequently there was a provision of cold drinking water which was carried in pails from springs and wells near the houses of the adjoining village.

There was not much milk consumed in camp except by the sick.

The solid kitchen garbage was carted away and

burned by the soldiers; the fluid was buried in sinks. Each latrine served for two companies, the sinks being from 4 to 8 feet deep. There was always trouble with water at the bottom of them, and there was consequently difficulty sometimes in covering the excreta. On one or two occasions the contents of one or two latrines overflowed. It was during the last two weeks while at this camp that the most trouble with sinks occurred. Flies swarmed. The sinks and kitchen refuse were black with them. They were the medium of conveyance of infection. Lime was used very freely, but it did not shake off the flies.

There was a narrow strip of lowland very near Companies A, B, and C, upon which water accumulated and stood for a long time. The adjoining village above mentioned was located upon the opposite side of this pond. It was called West Charleston. There was no typhoid fever known in this village until after it made its appearance in camp; then there were one or two cases in houses located below this pond. Malaria and rheumatism were more marked in Companies A, B, and C, in the neighborhood of this pond, than in the other companies. There was no epidemic (of typhoid fever) at Charleston at the time of its existence at the camp.

There was very much diarrhea and dysentery at Charleston during this time. Some deaths from this cause occurred in the civil population of that city. "We had about 14 cases of typical typhoid fever in camp here at Charleston and 4 to 6 cases of typho-malaria. The latter did not respond to quinine, and lasted from four to six and eight weeks. In fact, they were left by us in the city hospital when we struck camp. There were only a few light attacks of intermittent malaria, which quickly responded to quinine. These lasted five or six days." Upon removal of the regiment from Charleston to Camp Meade 15 cases were left behind in the municipal hospital there, about 11 of them being typhoid.

Camp Meade, Pa.—The regiment arrived at Camp Meade, Pa., August 20, and went into camp near the canal and the medical supply depot, remaining upon that spot about ten days. This ground was low and damp, and there was no flooring or straw in the tents. The men contracted considerable malaria there. Company H first got sick at that point.

The camp was changed to the edge of Middletown (Homestead farm) about the 1st of September, remaining there about three weeks. Before leaving this camp Company H had more sickness than any other company. "The hospital records show typhoid fever."

While in camp at Middletown the city water supply was used, it being hauled in wagons.

The camp site was again moved about the 15th of September to a site near the One hundred and fifty-ninth Indiana and to the south of and lower down than the Two hundred and third New York. But the surface drainage of these two regimental camps did not,

however, flow through the camp of the Second West Virginia.

On the 20th of September the Second West Virginia went on a march to the battlefield of Gettysburg, Pa., leaving behind less than 100 invalided men to guard the camp.

Up to this time the fever had increased until the last week before starting on the march. During that last week there had been much less fever. Gettysburg, Pa., was reached on the 27th of September, and while en route to that point 10 sick soldiers were sent to Carlisle, Pa. The regiment halted four days at Gettysburg, Pa., and from there sent 11 men sick to Carlisle, Pa., on October 1, the date of arriving at that point. The regiment then marched from Gettysburg to York, Pa., being en route three days. York was reached October 4, and upon arrival there 8 sick were sent to the hospital of that city. The regiment departed from York on October 6 for Camp Meade, arriving there October 10. During this march the surgeon thinks no case of continued fever developed or was sent to the hospital (Second Division). Some malaria was sent to the hospital after the return of the regiment to Camp Meade, but the surgeon thought that he had gotten entirely rid of the typhoid fever. The malaria spoken of lasted only two or three days with elevated temperature and was arrested without quinine.

Maignen and Berkefeld filters, 12 pairs, were issued to the companies of this regiment at Middletown. Companies H and D have not now (November 2, 1898) these filters in use. These filters were not used on the march. No special precautions were taken about the water supply on this march. "We had more trouble with diarrhea on this march than at Meade. We have had altogether about 175 men in the hospital since coming to Meade." We have had A wall tents, four men to a tent, with no overcrowding.

Lieut. W. F. Davley, assistant surgeon, Second West Virginia, being present and having heard all his colleague Lieutenant Kalbaugh had said, agreed with and confirmed his testimony.

ABSTRACT OF A COMMUNICATION FROM THE COMMANDING OFFICER OF COMPANY I, SECOND WEST VIRGINIA VOLUNTEER INFANTRY.

Camp Meade, Pa.—Capt. Melville G. Sperry, commanding Company C, stated substantially as follows: The companies of the regiment were grouped in battalions in all of the camps as follows: First Battalion, Companies A, C, M, and B; Second Battalion, D, F, G, and E; Third Battalion, H, K, L, and I. Sometimes the tents were all placed on one side of the company street, but in their location at Camp Meade they were placed on both sides.

At Camp Meade my company was not on detached service.

My company came chiefly from the rural districts. The average intelligence of the company was high. The men were generally prudent, with only a few exceptions.

My impression is that my company suffered less from typhoid fever than other companies. I do not know why, but think that the men composing the company, coming from rural districts and good homes, paid more attention to personal cleanliness than the average volunteer soldiers.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

July.—(Camp Atkinson, W. Va.) Mean strength averaged for 22 days: Officers, 41; enlisted men, 1,098; total, 1,139. Admitted from command, 47; total to be accounted for, 47. Of 14 completed cases 14 returned to duty.

Z. B. Kalbaugh, assistant surgeon, makes no remarks.

August.—(Camp Atkinson, W. Va., and Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 44; enlisted men, 1,276; total, 1,320. Remaining from last month, 31; admitted from command, 11; total to be accounted for, 42. Of 40 completed cases 15 returned to duty, 1 died, 2 discharged for disability, 6 deserted, 15 transferred to other hospitals, 2 otherwise disposed of.

Lieut. Z. B. Kalbaugh, assistant surgeon, makes no remarks.

September.—(Camp Meade, Pa.) Mean strength averaged for thirty days: Officers, 45; enlisted men, 1,252; total, 1,307. Remaining from last month, 11; admitted from command, 140; total to be accounted for 151. Of 140 completed cases none returned to duty, 4 died, 11 deserted, 13 transferred to other hospitals. (Notice the discrepancy between these figures.)

Lieut. Z. B. Kalbaugh, surgeon in charge, makes no remarks.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 45; enlisted men, 1,061; total, 1,106. Total to be accounted for, 112. (Source of admissions not given.) Of 112 completed cases none returned to duty, 8 died, 1 discharged for disability, 7 deserted, 12 transferred to other hospitals, 100 otherwise disposed of. (Note the discrepancy between these figures.)

Lieut. Z. B. Kalbaugh, assistant surgeon, makes no remarks.

November.—(Location not stated on sick report.) Mean strength averaged for thirty days: Officers, 41; enlisted men, 1,006; total, 1,047. Total to be accounted for, 46. (Sources of admissions not given.) Of 46 completed cases none returned to duty, 6 died, 3 discharged for disability, 5 deserted. (This report is incomplete.)

Maj. W. T. Henshaw, surgeon, makes no remarks.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE SECOND WEST VIRGINIA VOLUNTEER INFANTRY.

Brief outline of the medical history.—This second-call regiment assembled at the State camp near Charleston, W. Va., and was mustered in between the 25th of June and the 9th of July, 1898. It remained in camp there on one site until the 19th of August, when it started for the national camp in Pennsylvania. On the 20th of August it reached Camp Meade, Pa., and was assigned to the First Brigade, Second Division of the Second Army Corps. For the first ten days after arrival at Camp Meade the regiment occupied low and damp ground near the canal, railroad, and medical depot. At the end of this time it moved to higher ground at "Homestead farm," in the edge of Middletown, and while there used the water supply of that town, hauled in wagons. About the 15th of September the regiment moved again, this time to the camp of the First Brigade (see general sketch map of Camp Meade), where it encamped upon a site near the Two hundred and third New York, which also arrived direct from its State camp and was a member of this brigade. The Fourth New Jersey, also direct from its State camp, was a member of the same brigade, but did not arrive at Camp Meade until after the isolation of the Two hundred and third New York on account of infection. At the time the Second West Virginia joined its brigade the One hundred and fifty-ninth Indiana, from Camp Alger, Va., was a member and located near. The camp of the Second West Virginia did not, however, receive the drainage of its two neighbors. (Other Camp Alger regiments, the Twenty-second Kansas and the Third New York, under orders to be mustered out, were also temporarily attached to this brigade. See their histories under Camp Alger.) On September 20 the Second West Virginia left Camp Meade for a practice march to the battlefield of Gettysburg, etc., leaving something less than 100 invalids behind to guard their camp, and returned again to Camp Meade on the 10th of October. The command now remained in this camp without further change until the 13th of November, on which date it started by rail for Camp Wetherell, S. C. The last monthly sick report of this regiment found by us is for the month of November, 1898. Although the location of the regiment is not mentioned therein, we have no doubt that the command reached its destination in the South and remained there until the end of the year. It certainly was mustered out of the service of the United States at Greenville, S. C., on the 10th of April, 1899.

The medical history of this regiment as prepared by this board covers a period of only five months and five days (to the end of November, 1898). Of this time, fifty-five days were spent in the State camp near Charleston, W. Va.; eighty-five days at Camp Meade,

Pa., of which ten days in the temporary camp on low, damp ground near the canal, railroad, and medical supply depot, sixteen days at "Homestead farm," in the edge of Middletown, five days encamped with the First Brigade, twenty days on practice march to Gettysburg, etc., thirty-four days in Camp Meade after return from practice march; fifteen days in Camp Wetherell, near Greenville, S. C. (to the end of November, 1898).

This regiment began to suffer to some extent from typhoid fever while in the State camp near Charleston, W. Va. It carried the infection to the national camp in Pennsylvania, and by the time of its arrival there an epidemic of the disease was already well advanced. The height of this epidemic was reached eleven days before the regiment started on its practice march on the 20th of September for the battlefield of Gettysburg. There was a very sharp decline during those eleven days, followed by a recrudescence during the march, and again another fall after returning to camp. The epidemic continued to drag along through the occurrence of scattering cases, fewer and fewer in number, until the departure of the regiment from Camp Meade, Pa., for the national camp in the South. The infection was not altogether extinguished when the command reached Camp Wetherell, near Greenville, S. C., since an attack now and then made its appearance in the latter half of the month of November, and we learn of two probable cases of typhoid which developed in the first ten days of December.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (typhoid included) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks are recorded as closely as they could be ascertained:

[Second West Virginia Volunteer Infantry; mean strength, 1,165.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	
July.....					2	2	2	17	21
August.....					6	9	13	21	43
September.....	2	3		5	40	11	34	35	80
October.....		1	1	2	21	6	20	38	64
November.....	1	1		2	7	1	8	9	12
December.....					1	1		1	2
Total.....	3	5		8	77	30	77	112	219
									15
									2

The above-tabulated deaths from disease by months were distributed among the companies as follows:

	Company.									Total.
	A.	B.	E.	F.	G.	H.	I.	K.	M.	
Typhoid.....	1	1	1	2	2	3	1	2	2	15
Other diseases.....		1			1					2
Total.....	1	2	1	2	3	3	1	2	2	17

The following is a series of three tables showing by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders, in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering), and (*b*) who have had such other attacks.

Intestinal disorders in the Second West Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea.....										2	1			3
Single long diarrhea.....					2		2	1						5
Total diarrhea.....					2		2	1		2	1			8

Totals include diarrhea in malaria and typhoid combinations.

Combinations of continued or malarial fever in the Second West Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	2	6	5	5	5	11	3	2	8	7	9	3	1	67
Two attacks short malaria.....										1				1
Long malaria (uncombined).....	4	2		3	2	1	2	5	3	3	2	1	2	30
Total short malaria.....	2	7	5	6	5	11	6	3	8	9	10	4	1	77
Total long malaria.....	4	2		3	2	1	2	5	3	3	2	1	2	30

Totals include malaria in typhoid combinations.

Combinations of typhoid fever in the Second West Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	9	8	9	7	9	13	9	15	7	10	3	8	2	109
Probable typhoid (uncombined).....	1	12	8	4	6		10	8	3	5	7	6	1	71
Probable typhoid beginning in diarrhea.....				1										1
Typhoid preceded by malaria.....		1						1				1		3
Probable typhoid preceded by malaria.....				1			2				1			4
Total certain typhoid.....	9	9	9	7	9	13	9	16	7	10	3	9	2	112
Total probable typhoid.....	1	12	8	6	6	1	12	8	3	5	8	6	1	77
Total probable and certain typhoid.....	10	21	17	13	15	14	21	24	10	15	11	15	3	189

The records of sickness in this regiment were found to be more or less incomplete and to some extent conflicting. By way of illustration: The sick report for the month of December was not found by us. Furthermore, there were 59 cases of so-called malaria, etc., among the records relating to this regiment whose final disposition was not indicated. How many of these were really typhoid fever and should have been added to the total probable typhoid fever attacks given in the

above summary table it was of course impossible for us to determine. That there were at least some, possibly many, we think can not be reasonably questioned. The foregoing tabular statement of sickness should on the whole be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Second West Virginia Volunteer Infantry, as a member of the First Brigade and Second Division of the Second Army Corps, as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Charleston, W. Va., from June 25 to August 19; it was at the national camp, Camp Meade, Pa., from August 20 to November 13, changing ground there on the 1st, 15th, and 20th of September and October 10; it is probable that the regiment was in Camp Wetherell, near Greenville, S. C., from November 15 to December 31, 1898; it was mustered out at Greenville, S. C., on the 10th of April, 1899. The initial date of the first probable attack of typhoid fever was July 10; of the first certain attack of typhoid fever was July 5. This regiment was infected with typhoid fever in its State camp, and carried the infection with it to the national camp in Pennsylvania. Notwithstanding frequent movements, including a long practice march while attached to Camp Meade, Pa., the infection tenaciously adhered to the command. The medical history as given by the board covers a period of five months and five days (from June 25 to November 30, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 8; of so-called short malaria, etc., 77; of so-called long malaria, etc., 30; of probable typhoid fever, 77; of certain typhoid fever, 112. Total attacks of probable typhoid fever (long malaria, etc., included), 219.

(c) Total deaths from typhoid fever, 15; total deaths from all diseases, 17; mortality per cent of total probable typhoid-fever attacks, 6.84; of total certain typhoid-fever attacks, 13.39; per cent of typhoid deaths to total deaths by disease, 88.23.

(d) The mean strength was 1,165. The per cent of typhoid morbidity to mean strength: As to total probable typhoid attacks was 18.79, while the average for the brigade was 21.38; as to total certain typhoid-fever attacks was 9.61, while the average for the brigade was 14.22. The number of typhoid deaths per 1,000 of mean strength was 12.87, while the average for the brigade was 9.01 and for the division 8.78.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of

typhoid fever, and we have obtained the following figures as to the Second West Virginia:

Disease.	Individuals.	Average age.
Short intestinal disorders	1	38.0
Long intestinal disorders	2	21.5
Total intestinal disorders	3	27.0
Short malaria, etc.	37	23.9
Long malaria, etc.	20	25.8
Probable and certain typhoid attacks.....	145	23.4
Total probable and certain typhoid and long malaria.....	165	23.7
Grand total of all above classes	205	23.7
Eleven soldiers who died from typhoid fever.....		23.8

For comparison of these average age figures with similar data relative to other regiments in this brigade and division we refer to the general tables treating of this subject at the end of the Second Army Corps as at Camp Meade, Pa. (See also similar tables relating to the regiments of the Second Division of the Seventh Army Corps at Jacksonville, Fla.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) We regret that the records of sickness in this regiment are so fragmentary than nothing conclusive concerning this subject matter is contributed by the history of this regiment. As far as the fragmentary evidence goes, however, it would seem to be harmonious with that furnished by other regiments studied by the board from this standpoint, and we may therefore repeat in a general way the statement we have already made concerning other regiments: That the course of the disease in this regiment is characterized by a series of company epidemics, each one having more or less perfectly its own individual characteristics. This is especially true when we regard the commencement, the exacerbations during the course, and the time of termination of the company epidemics; and when thus regarded they are rarely seen to be synchronous. Not only are there variations in these company epidemics considered as integral parts of the regimental organization, but there is as a rule no striking similarity in the course of the epidemics, even in companies grouped together in battalion organizations. While there are general dissimilarities in the course of the company epidemics in the Second West Virginia, especially as to origin and termination, reference to the graphic chart shows one or two features which when compared with the characteristics of the graphic charts of other regiments must be regarded as exceedingly peculiar. The first striking peculiarity is in the evidence of a most extraordinary exacerbation or very general

outbreak of typhoid fever in every company of this regiment on the 9th of September, nine days after the removal of the regiment from its first camp at Camp Meade. The chart shows that from the 20th of August, the day of arrival of the regiment in the national camp at Camp Meade, up to the 9th of September, there was more or less typhoid fever scattered throughout the companies constituting this command, ending in the most extraordinary exacerbation, already mentioned, on the 9th of September.

Another peculiar feature of the chart of this regiment is the even more extraordinary sudden cessation of the epidemic between the 10th and the 29th of September, inclusive. While this sudden outbreak on the 9th of September may possibly be attributable to a universal infection, such as could be conveyed alone by water, or to a sudden reporting and recording of a large number of cases which may have accumulated up to that date, there is no other explanation of the apparent immediately succeeding interruption, as indicated by the chart, which we can conceive of except that of a general hiatus in the records of sickness in the regiment during this time. Concerning this point, we may refer to the fact, as the graphic chart shows, that there has been scarcely any reported abdominal disturbances in this regiment—this, notwithstanding the fact that abdominal disturbances have been spoken of in the testimony of the medical officers of the regiment. It is difficult to admit that this regiment alone of all those constituting the Volunteer Army could have entirely escaped disturbances of the intestinal tract. According to the testimony of the commanding officer of Company C, the companies of this regiment were grouped in battalions in all of the camps, as follows: First Battalion, Companies A, C, M, and B; Second Battalion, D, F, G, and E; Third Battalion, H, K, L, and I.

(b) With the already mentioned qualification as to insufficient records in this regiment, we may say, as we have concerning other regiments, that the company epidemics of this regiment experienced frequent greater or less exacerbations in their course, and the intervals between these exacerbations as a rule were closely coincident with the average period of incubation of typhoid fever.

TWO HUNDRED AND THIRD NEW YORK VOLUNTEER INFANTRY.

First Brigade, Second Division, Second Army Corps, Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. B. S. Booth, surgeon.]

Camp Black, near Hempstead, Long Island.—Major Booth arrived at Camp Black about the 24th of July, 1898. The health of the command was then good, and continued so until about the 10th of August, when the trouble began which developed later into a very serious epidemic of typhoid fever.

With reference to the conditions existing at Camp Black, Major Booth stated that there was a deep gully between the site of the camp of the Two hundred and third New York Regiment and the general or brigade headquarters. A shallow well down in this gully is believed to be the origin of the infection of this regiment. He states that Colonel Schuyler, who commanded this regiment, and was the commanding officer at Camp Black by reason of being the ranking officer, had often noticed that during intervals of drill the commanding officers of Companies A and E, which were frequently drilling near the location of this well, permitted their men to fall out of ranks to drink water from it. The men from these two companies used this well in this manner more than did the men of any other companies; in fact, it was these two companies which were always drilling nearest the well.

Camp at Conewago, Pa.—The epidemic of typhoid fever is now nearly ended in this regiment. (This testimony was taken November 2, on the occasion of the second visit of the board to Camp Meade. At their first visit, about October 7, the surgeon was absent on leave.) The following weekly totals of patients falling ill with the disease indicate this fact very clearly. During the first week, ended October 9, 26 cases were sent to the hospital; during the next week, 24 cases; the following week, 19 cases; the week after, 9 cases, this latter being the week ended the 29th of October.

[Lieut. W. A. Burgess, acting surgeon in charge.]

Camp Black, near Hempstead, Long Island.—Eight companies of this regiment were mustered in at Syracuse, N. Y., and four companies in New York City, being mustered in at these two places simultaneously. As soon as a company was mustered it was sent off to Camp Black, one after another. Mustering began on the 5th of July in Syracuse, and was finished there about the 20th of the month. While in Syracuse the men bivouacked in the armory.

The water supply there was that of the city, coming from a hydrant in the armory. Excrement was disposed of through the water-closets of the armory.

As stated, as soon as a company was recruited it was sent off to Camp Black, the first company going there about the 8th or 9th of July and the last one about the 22d of July. As the companies were mustered they were given their alphabetical letters in regular rotation, A and B companies being the first to proceed to Camp Black and H and K the last. Companies A, B, C, and D were from Syracuse, and E company, which subsequently suffered severely from typhoid fever, was from Watertown. One-half of the men of Company H were from New York City, and Companies F, K, and another, whose letter is forgotten, were also from the same city.

Previous to the occupation of Camp Black by the Two hundred and first, Two hundred and second, and Two hundred and third New York Regiments, twelve of the first-call New York organizations had preceded them in occupying that camp. Lieutenant Burgess

believed that the Fourteenth New York Infantry, commanded by Colonel Grant, had previously been on the same ground occupied later by the Two hundred and third, the sinks of the Fourteenth, however, being 300 feet farther away to the north than those of the Two hundred and third. The camp of the Two hundred and third was not placed exactly upon the site of that of the Fourteenth, but was shifted a little south of the latter, so that the line of sinks of the Two hundred and third ran along about the line of the Fourteenth's kitchens. "I was down there when the Fourteenth was there, and remember it that way." The regimental headquarters and line of officers' quarters were on the opposite side of the regiment; that is, on the south flank.

During the first two weeks at Camp Black, while the mustered companies were arriving and establishing themselves in camp, there was no surgeon of this regiment present; nor was there at that time a surgeon of any other regiment present. Major Wilcox was in charge of the post hospital at Camp Black from the time of the arrival of the first company there, but he was not attached to the troops.

The Two hundred and third New York occupied Camp Black in company with the Two hundred and first and Two hundred and second New York Infantry and Fourth, Fifth, and Seventh New York Batteries. The location of the Two hundred and third New York in respect to the other organizations was as follows: The Two hundred and third was located on a bluff, elevated above the other regiments. The batteries, comprising a strength of 318 men, were located on our east flank, with the regimental or battalion space between us. The sinks of the batteries were in the same continuous line with ours on the north flank. Those men were under the medical care of the surgeon of the Two hundred and third New York, there being no medical officer with those organizations. Directly on the west of the Two hundred and third, and separating the latter from the camp of the Two hundred and first, was the camp of a body of 180 recruits for the Seventy-first New York. These were encamped on low ground, and the men attended sick call under the surgeon of the Two hundred and third New York, no medical officer being on duty with them. These recruits never joined their regiment. Lieutenant Burgess thought the active command of the Seventy-first New York had been located at Camp Black when they were first ordered out.

Two hundred yards to the rear—that is, to the north of the camp of the Two hundred and third New York—the post hospital was located, and back of it, still farther to the rear, were the sinks of that hospital.

The water was not stored at Camp Black. The general water supply at Camp Black was from two sources, one being brought into camp in iron pipes under pressure from the town of Hempstead, about 4 miles away, and distributed in the camp of the Two hundred and third through two mains, running upon the surface of the ground. These mains, however, were slightly cov-

ered with loose earth heaped over them. One of the mains ran along on the north side of the regiment, just to the north of the line of company kitchens; the other ran along the south side of the regiment, just to the south of the line of officers' quarters. These mains were tapped for the use of the companies where they were crossed by the company streets.

In addition to this supply of water there were in use at first a number of shallow wells with pumps, located a little south of the line of organizations mentioned as comprising the camp. There were none of the wells back—that is, to the north—of the camps of these organizations. Soon after the arrival of the Two hundred and third New York in camp the surgeon of that regiment, being the ranking medical officer, closed these shallow wells, except one in front (a little to the south) of the artillery camps, which remained open for the use of those organizations; one in front (to the south) of the west company (A) of the Two hundred and third, near the commissary stores, about half way between the south flank of the regiment and general headquarters, which was kept open for the use of the cattle; and one which had no closet within 200 feet of it, near the vender's shacks, about one-fourth of a mile south of the camp of the Two hundred and third New York. The shallow well in front of Company A of the Two hundred and third New York was in very low ground, which received more or less of the surrounding surface drainage, and the ground around was constantly wet and tramped upon by the cattle. On the contrary, the well in front of the artillery organizations was higher, with the surroundings dry and in good condition. The men of the artillery commands frequented this well, as did also many of the men of the Two hundred and third New York, especially those of Company M, which was on the east flank of the regiment. A few of the men toward the west flank of the regiment may have taken water at times from the low well with the wet surroundings near Company A and the commissary's stores, but even they probably more frequently resorted to the well of the artillerymen when using well water.

There was a group of shacks, already mentioned, occupied by licensed venders of lemonade, milk, and such things, located about a quarter of a mile south of the camp—these shacks being common to all of the command, there being no others located near the camp. These shacks, as has been already stated, were furnished with a shallow well.

After we began to be aware that the regiment was suffering from typhoid fever we suspected the water supply from Hempstead and had it analyzed. In the meantime an order was issued for boiling all of the water supplied by the pipes. This order for boiling did not extend to the water which may have been obtained from the above-mentioned wells. After the result of the analyses proved the Hempstead water to be beyond suspicion the order for boiling was rescinded. But

even during the time this order was in force the men were not entirely restricted to the use of boiled water, for since they came and went as they pleased they frequently visited farmhouses in the neighborhood and drank as they pleased. It was at this time that the shallow wells of the camp were closed, with the exceptions already noted. An officer's mess was established sometime about the 1st of August. Previous to that time Lieutenant Burgess was under the impression that they had generally consumed the well water, counting from their arrival in camp with their companies. Yet only two of the officers were taken sick in the early period of the infection of the regiment. "The water supply which came from Hempstead through pipes over the top of the ground was always warm, and when I first arrived at Camp Black, I was told it was simply washing and cooking water; that the drinking water was to be taken from the wells. This was not official information. I was simply notified to that effect by some of the officers who had been there two or three weeks before I came. This meant, of course, that probably up to the time of my arrival the regiment had been using well water for drinking purposes and the pipe water only for washing and cooking. That would be a space of about two weeks. The wells were kept open about a week after I arrived there before Major Booth (the surgeon in charge) closed them." That would bring the date of closing the wells to about the 1st of August. All of the wells were closed at that time except one which was left open three or four days for the use of the horses. But even that was subsequently closed, the animals being afterwards watered from the pipes. (It is the well in the low ground in front of Company A of the Two hundred and third New York of which Lieutenant Burgess is here speaking.) There was one well left open in front of the artillery for the use of their horses. It was also closed not many days after the others had been closed, when the artillery horses were likewise supplied with water from the pipes.

Reference has already been made to two lines of water mains—one just north of the line of kitchens and the other just south of the line of officers' quarters at opposite flanks of the camp. It has also been stated that the water mains lie upon the surface of the ground, slightly covered with earth heaped over them a few inches deep. By the side of each of these water mains was a drainage ditch, separated from the pipe by a little more than a foot. The drain near the tents of the company officers was intended to flow eastward, but there was really very little or no flow at all. The drain just north of the line of kitchens was intended to flow both east and west from the middle point, but there was always more or less water in this drain, because it took the waste water from the water pipes; on the contrary, the drain near the officers' quarters usually contained no water.

It frequently happened that the water had to be

turned off from the water mains temporarily for repairs, thus frequently interrupting the pressure in them. The pressure in these pipes was usually rather high, for they burst quite frequently, thus necessitating the water to be turned off. During the time of the interruption of pressure in the water pipe the neighboring drain was always full of fluid contents. In fact, there was always a few inches of water in this drain. The water mains were already established in this camp when the Two hundred and third arrived here. Almost immediately upon the arrival of the regiment in camp shallow drains near the pipes were dug to carry off waste water. These drains were deepened about two weeks after the first companies arrived, in order also to carry off the surface water from rains. Moreover, another drain was dug about the latter time, on the east flank of the camp, for the purpose of connecting the two drains above mentioned. These drains were so imperfectly constructed that you could not tell which way the water was running. The consequence was that all of the time there was more or less polluted water filling the north and east drains. The south drain, near the tents of the company officers, was, on the contrary, usually dry.

There was a gully, shaped more or less like an elbow, having two arms, one on the south and the other on the west flank of the regiment, and at the point of junction of these two arms the gully ran off into lower grounds. It is in the low ground at the junction of these two arms where was located the pump opposite the front of Company A, as already mentioned. This is the pump to which Colonel Schuyler and Major Booth referred as having been frequently used by the men of Companies A and E during the intervals of drill. The southern arm of this elbow began at the regimental headquarters.

The milk supply at Camp Black was obtained from farmers in the locality. There was no fixed supply, but about four milkmen came into the camp, each one having his own customers, and no one man going through the whole regiment. Some of these men supplied one or two companies. The largest supply of milk was obtained from a man who furnished the officers' mess. Upon the outbreak of fever Lieutenant Burgess's colleague, Doctor Haynes, made an investigation of the milk supply, visiting different farms, and inspecting the surroundings of the farm dairies, households, and their water supply; but the result of this investigation, as to the possible introduction of typhoid fever through the milk, was that no suspicion was cast on the milk consumed in the camp. No sickness was found among the farmers. "In fact, they would deny it even if they had it right in the house."

The sinks of the Two hundred and third were in a line on the north flank of the regiment, about 70 yards distant, back of the kitchens—one for each company. As the sinks would be filled and others dug, the line

sometimes came nearer and sometimes farther from the kitchens. The changes did not vary the distance much over 25 feet. Not wishing to move them toward the regiment, they were frequently shifted sidewise. They could not be moved directly backward any great distance on account of the location of the post hospital. These sinks were simply pits dug in the ground 8 or 9 feet deep. They never struck water. Once a day the fecal matter was lightly covered with earth, and as often sprinkled with slaked lime, but at different times, the lining being done by the provost guard, and the earth being thrown in by a company detail. Moreover, about every third day chloride of lime was used. These sinks were not in bad condition through neglect, or as regards bad odors, and they never became offensive. But there was an extraordinary number of flies, both at the sinks and kitchens; the flies did not invade the company tents in large numbers.

Remark by the board: "In undertaking to define the origin of infection of your regiment, especially in accounting for the outbreak in the first companies affected, A and E, the surgeon, Major Booth, stated that there was one well on or near the parade grounds which was resorted to by those two companies during intervals of rest in parade. He stated that the colonel had frequently seen the men of those two companies fall out of ranks and go to drink that water. This fact was very definite in the recollection of Colonel Schuyler, commanding the regiment, because it had irritated him greatly to see the captains allow their men to practice that breach of duty under his eyes." Reply of Lieutenant Burgess: "Those captains did make it a point to bring their commands to these wells. And Company A was the first, and Company E the second, to go down with typhoid fever. But these men also resorted to another pump southeast of Company M, namely, the one already mentioned as located in front of the battery organizations. In this connection it is to be noted that none of the three batteries had any fever amounting to anything, and M company, which was nearest to the batteries, and frequently used that pump, did not have a case of typhoid fever while at Camp Black. When M company got to Meade, however, it had more sick men than any other."

After arriving at Camp Black the command was much troubled with diarrhea. Lieutenant Burgess thought, however, that during the first two weeks at that camp the sick call was very light and the diarrhea not troublesome. It was after that the marked diarrheal trouble began. For the first few days this marked diarrhea was thought to be due to change of food and water and to consumption of the green fruit that was just coming in. But most of the men, instead of recovering promptly from the attacks, kept getting worse until sent to the post hospital. There the cases passed from under our observation. These diarrheas were soon found to be accompanied with fever. After we began to suspect

that there might be some other cause than the fruit we began to take temperatures, and we found almost invariably a rise of from 1 to 4 degrees. These temperatures would be continuous until they finally went to the hospital. We sent these men to quarters as soon as we thought advisable, and they were kept under observation for several days before transfer to the post hospital. As already mentioned, this diarrhea did not begin until about two weeks after the arrival of the regiment in camp. The diarrheal outbreak had been running on about four days before we began taking temperatures. It was then that the existence of accompanying fever was first noticed. By this time we had already begun to suspect that these cases might be typhoid fever. No actual definite diagnosis to that effect had been made. Some of the medical officers present in the camp were convinced of the typhoidal nature of the cases and some were not.

When the matter began to assume a serious form the surgeons of the Two hundred and third New York awoke to the fact that there was trouble. I believe one night we sent over 20 cases to the post hospital. They filled the hospital at that time to overflowing, for they were not prepared there to receive any large number of cases. The next morning after this incident all of the surgeons in Camp Black were notified. Major Spencer, of the Two hundred and first; Major Burr, of the Two hundred and second, and Major Booth, of the Two hundred and third New York Volunteer Regiments met at the post hospital for consultation. At that time there were 50 of these suspected patients in the hospital, there being about 70 inmates altogether. The consulting board went through the wards and examined these men. There was a difference of opinion as to the nature of the cases. One of the surgeons expressed the opinion that there were 40 or 50 cases of typhoid, and another thought that 5 would cover the number of genuine (typhoid fever) cases. Not all of these cases were from our regiment, but the majority of them were. At that early period the outbreak in the Two hundred and third was very much more marked in some companies than in others. Companies A and E were the first two to suffer a decided epidemic. Other companies, however, had epidemics later. Company B followed close after A and E, as did also Company I; that is, within a week of the prior outbreaks. Company A had been the first to arrive in camp, and was followed there by Company B; E arrived somewhat later, and I next after that company. E was the second company in the Second Battalion, I being the third company in the same battalion. A and B were the first two companies of the First Battalion. After the outbreak in Companies A and E there was not much difference in the scattered way in which the other companies were affected. It is to be remarked, however, that Company M was the last one to be infected. This company had not had

many, if any, cases up to the time the regiment moved to Camp Meade. In fact, Companies M, F, and H were the least infected while at Camp Black. None of these companies, however, can be said to have been entirely unaffected, except possibly Company M. The latter company went a good while before it had any at all. It was, however, the last company to arrive in camp. Indeed, Companies M, H, and F were late in arriving at Camp Black; but they were in camp there about a month, and perhaps more, before they had any infection at all, Company M having certainly been there more than a month before its first case of typhoid fever appeared.

It is difficult to say how many cases of typhoid fever occurred in the Two hundred and third before the regiment left Camp Black. A lot of the men were furloughed and sent home; some of them were sent to one hospital and some to another. The cases passed out from under our observation, and it would be impossible to say how many sent to the post hospital were really cases of typhoid and how many were not. When Lieutenant Burgess first went on duty at the post hospital, at the time the regiment left for Camp Meade, there were 140 men in the hospital from the Two hundred and first, Two hundred and second, and the Two hundred and third New York Regiments, three-fourths or more being from the Two hundred and third. "But you see that was only a small percentage of the sick of the regiment, for many of them had been furloughed—that was the plan adopted. When it was found that the men were seriously ill they were furloughed and sent home." When the regiment was assembled at Camp Black its strength was nearly full, the smallest company having 104 men. Lieutenant Burgess could not say how many men were taken with the regiment to Camp Meade. He remained at Camp Black on duty in the post hospital for two weeks after the regiment went to Camp Meade, Pa. At the end of two weeks the post hospital at Camp Black was abandoned and all the men then in hospital (about 75) were sent to Nassau (civil) Hospital at Hempstead. No reports have been received from the surgeons in attendance at that hospital. Of course, as the men left behind in that civil hospital got better they were sent out with thirty days' furlough, granted by some officer in New York City. But we would not know whether these men were in hospital, at home, or where they were.

The Two hundred and third Regiment of New York Volunteers moved from Camp Black to Camp Meade on the Sunday nearest to the 10th of September.

Camp Meade, Pa.—Upon its arrival at Camp Meade, the Two hundred and third New York went into camp to the rear of the Second West Virginia and the Second Division Hospital. It remained on that site from the 9th of September to the 2d of October.

As to the water supply Lieutenant Burgess did not know of any precautions having been taken, except the

ordinary ones of cleanliness. There was a pipe-line supply, and a guard placed around the tanks to keep the men away. (Filters were not issued to this command until after they reached Conewago.)

At Camp Meade there was a guard over each company sink, and every man using the sink was obliged to immediately cover his own excrement with a shovelful of earth. These sinks were inspected every day by one of the surgeons of the regiment, and also by the officer of the day. Every morning slaked lime and chlorid of lime would be used in addition to the individual covering. With reference to the company kitchen, the sinks were located at the opposite end of the company street; and they were 200 feet distant from the nearest company tent. There was no trouble with flies at Camp Meade while Lieutenant Burgess was there. At this point a contract surgeon remarked that the kitchens had not been provided with proper blocks for cutting meat. The boards they had in use permitted absorption of the juice, and the flies gathered there.

As has been already stated, Lieutenant Burgess was not with his regiment during the first two weeks after it arrived at Camp Meade. He thought, however, that there had not been any decided epidemic of diarrhea since leaving Camp Black. After changing to Conewago, the regiment has had very little diarrhea.

Remark by the board, after having examined the regimental sick register: "Note the fact that there have been admitted since the regiment reached Camp Meade—from September 12 to September 29—294 cases of 'malarial fever.'"

The history of the disease during this time—September 9 to October 2, 1898—was substantially as follows: When the Two hundred and third first arrived at Camp Meade the sick call increased enormously, and they sent from 15 to 25 men per day over to the division hospital for the first few days. Then the sick call gradually dropped off before the time the regiment left that site. The lowest number of cases fell to 5 to 8 a day.

Conewago, Pa.—On the 2d of October the regiment was moved to the neighborhood of Conewago, a small station along the line of the Pennsylvania Railroad, distant about 8 miles from Camp Meade.

When the regiment first moved to Conewago, drinking water was transferred here from the general water supply at Camp Meade by rail in oil-tank cars. The men could not use this water, because of the taste of oil, and they consequently resorted to the neighboring farmhouse wells. It was only yesterday morning (October 7) that they brought down a fresh tank of water, free from the taste of oil. The regiment has been furnished with two filters per company—one Pasteur and one Berkefeld—but, as far as could be learned, were not employing them.

As to the course of sickness since the arrival of the regiment at Conewago, Lieutenant Burgess stated:

"We have had altogether since arriving at Conewago

26 patients in hospital, all but 4 of these being typhoid suspects. Fourteen of the 26 have been transferred to the Reading hospitals, including 2 lieutenants and 12 enlisted men. Both of these lieutenants have been under observation for several days—one of them from Company M and the other from Company H.

"There had been very little sickness among the officers at Camp Black, not over 4 of them altogether. I think the first officer taken sick was captain of Company F, about the 15th of August, his company not being severely affected. He was acting as major in command of his battalion at that time. Next after him to fall ill—about the 25th of August—was a lieutenant of Company E, one of the companies which at that time were having the most sickness. Not more than three or four days after that a lieutenant of Company F became sick. Next to become ill was a lieutenant of Company B, about the 1st of September. All of these officers were taken sick at Camp Black. Many officers have been taken down since the arrival of the regiment at Camp Meade.

"Since leaving Camp Black, the captain of Company A is sick. Two lieutenants of Company G were taken sick, I should say, about the 15th of September. Then come two lieutenants of Company D, the latter of them being sent to the hospital about September 27. The captain and a lieutenant of Company M, and a lieutenant of Company L have been sent out from here sick. I think that is all of the officers.

"Company H is one that is suffering the most severely at the present time (October 8, 1898). More men admitted to the hospital as typhoid suspects have fallen sick during the last week from that company than from any other.

"Typhoid fever has begun to decrease. Not over 20 suspects have been in the hospital in the last five days. In fact, it has markedly decreased since the first ten days or two weeks after the arrival of the regiment at Camp Meade.

"The number of deaths from typhoid since the regiment has been mustered in is either 11 or 12 (up to October 8, 1898), and the total number of cases of typhoid fever and of suspects, at a rough guess, Lieutenant Burgess estimated has been 400. Companies A and E were the first ones to experience the epidemic at Camp Black, and they have now only one or two men on sick call. Company A has had one death and E two deaths, yet half the men of these two companies have had the fever. There are still a great many of them remaining in the hospital and at home."

The opinion of Lieutenant Burgess as to the origin and spread of typhoid fever in the command is that "it originated in the wells at Camp Black. My reason for that belief is that the ground was an old camp, and the wells were only a short distance from the sinks where the former regiment was located. I do not mean, of course, right near them. The sinks of the old regiment

were on about the same line as those of the new. I understand that the wells were about 15 feet deep. You know the soil is gravel and sand; after you go through 18 inches of top covering of loam you get into the sand. The slope of the ground is from north to south, and the wells were on the south side of the old sinks. My opinion is that the infection came from these wells. After being once infected, I believe there are various ways by which the infection was carried. When the men were first taken sick, before typhoid fever was suspected, it seemed that the captains used to select men, who were marked 'light duty,' for work around the cook shacks, peeling potatoes, and things of that kind, which they could do while sitting down. These men were invariably dirty, and, having diarrheal trouble, they would go to the sink half a dozen times a day, and come back to the kitchen with their clothes and hands soiled to resume their work there. Another mode of infection was through the flies. You went down there at noon or meal time, and the flies would rise in swarms around the cook shacks. In the middle of the afternoon these swarms seemed to increase around the sinks, and at supper time they would come back again to the cook shacks. There was a perceptible difference at these various times remarked in the number of flies. Lime was used at the sinks." In response to a question: "The cooks did not call attention to the fact that flies left lime on the tables. I never heard it remarked whether flies did or did not carry lime from the sinks." Moreover, there was a reluctance among the commands at first to send men to the post hospital, and there was also a natural reluctance of the men to go there. On this account, as the sickness gradually developed, they were kept in their tents long enough to infect the latter as well as their tent mates. "Soldiers are proverbially nasty; they won't take a bath except in hot weather; and if they feel bad, they won't take it at all. Our attention was most particularly drawn to the condition of the drawers of the soldiers when they were bathed after being sent to the hospital. Their clothing was sent back to the tent; their blankets were also left at the tent and used by the remaining tent inmates. Some of the clothing, however, was put in a store tent without having been previously cleaned."

The attention of Lieutenant Burgess having been called by a member of the board to the fact that the regiment had been away from Camp Black from September 11 to October 7—namely, twenty-seven days—Lieutenant Burgess replied: "In regard to that, my opinion is that the infection almost entirely took place at Camp Black and that we are now having very little new infection from any source. What we are having comes from uncleanness and sources almost impossible for us to get at, such as tent infection and comrade infection just referred to, etc." Question by the board: "You have spoken of this tent infection and infection from comrade to comrade. Have you taken any pains

to note, or have you been particularly struck with tent epidemics; that is to say, with tents that have furnished nearly every inhabitant as a sick member?" Lieutenant Burgess replied: "It had been observed all through the camp that it was frequently found that one man in a tent would be taken down, and then another, and then another, until all the tent comrades became infected. While this has been noted, it has also been observed that there were tents in which none of the men have been infected."

Greenville, S. C.—Testimony as to the regiment in this locality was taken December 23, 1898. The regiment left Camp Meade (Conewago) November 11 and arrived at Greenville, S. C., November 12. It was a member of the Second Brigade, Second Division, Second Army Corps. The camp site at Greenville can not be beaten; it is high, the ground is rolling, and there is good natural drainage. It is an ideal place; the soil is deep and of a light sandy loam.

The water supply is that from the city of Greenville. It comes from Paris Mountain, away back in the mountains. It is brought out from the city to the camp in iron pipes and is distributed throughout the camp under pressure. It is a most excellent and wholesome water.

The regiment was supplied, before leaving Camp Meade, with two filters per company, a pair to be worked in unison consisting of Maignen and Pasteur filters. There is also a pair of these filters at the regimental hospital. Lieutenant Burgess was not certain if there was also a pair of them at regimental headquarters. The whole lot of this filtering apparatus is out of gear. They have been out of repair ever since the regiment has been at Greenville, and there is no possibility of repairing them here; there are no extra supplies, and there is no one here who knows how to repair them. It is the Pasteur filter which is out of order; the Maignen seems to work all right. Neither is there any special apparatus provided for aerated boiled water. "I personally would not consider it necessary to filter that water anyhow, for I do not see how it can be other than all right."

The method of disposing of fecal matter is the same as prevailed at Camp Meade—pits dug in the earth; individual covering of the feces, with a sentinel stationed at the sink. The orders respecting this matter are faithfully executed. There is never a suspicion of water at the bottom of these sinks.

There has been no diarrhea or indigestion of any consequence since coming here. The only sickness that has required treatment has been colds, coryza, etc.

Since arriving at Greenville we have not had more than three cases in the (regimental) hospital at one time, and have had only one case of typhoid fever and another suspicious case. We have only sent one man to the division hospital since we arrived here and that was the case of typhoid just mentioned.

The men who have been away from the regiment sick are coming back, and we now have quite a good regiment. Our total strength is now about 1,000, being about 100 men short.

Recurring to the commands encamped at Camp Black, Long Island, Lieutenant Burgess stated that when the batteries were mustered out there were only 2 of their men in the hospital among a total of about 127 men sick in the post hospital at that time. The men of the batteries drank the well water from the pump in front of them, but they would not be very apt to drink from the low well at the junction of the two arms of "the gully" near the front of Company A of the Two hundred and third New York, already described.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE TWO HUNDRED AND THIRD NEW YORK VOLUNTEER INFANTRY.

Camp Black, near Hempstead, Long Island.—Capt. John P. Tuck, commanding Company A, furnished a list of men grouped in tents at Camp Black, N. Y., and Camp Conewago, Pa., and stated substantially as follows: The order of companies in the regimental camps from right to left at the following places was: Hempstead—A, B, C, and G; E, I, K, and D; F, L, H, and M; Middletown—A, I, M, and E; C, D, H, and G; B, L, F, and K; Conewago—C, D, H, and G; B, L, F, and K; A, I, M, and E. (The numbers or order of battalions is not stated.)

This company was not on detached service at either of the foregoing camps.

My company was chiefly from an urban population. The average intelligence of the men was high, and they were reasonably prudent as to personal conduct and habits affecting their health. The financial status of the majority was above the average.

My company suffered from typhoid fever probably more than any other company in the regiment, with the exception, perhaps, of Company E. The only reasons that I can assign for my company suffering more than the others are, first, that we were in Camp Black several days before any other company joined us; second, that the men composing Company A were younger and less used to exposure and hardships than the average; third, that the drill ground assigned to us was in close proximity to a well which we freely used in the hot weather, and which the men were allowed to go to during rest in the drill hours; fourth, this company had the right, or extreme west, of the camp on the brow of a slight elevation. The drainage of the entire camp flowed toward the west in the rear of our company camp into an open cesspool, a depression a little more than 100 yards to the west of our kitchen.

Capt. Edward P. White, commanding Company C, furnished a list of men grouped in their tents at Camp Black, and stated substantially as follows: The group-

ing of the men in tents at Camp Meade was substantially the same as at Camp Black.

This company was not on detached service.

Its members were chiefly from villages and small cities and were mostly mechanics and workingmen, their intelligence being medium, and they were reasonably prudent as to personal conduct and habits. The financial status of the majority was about the average of the regiment, perhaps slightly above.

This company had more deaths from typhoid fever (4) than any other company in the regiment, but there were companies which probably had as many or more cases. The deaths were probably attributable, in my opinion, to the inadequate facilities of the division hospital at Camp Meade and the transfer of patients to distant hospitals. My observation of the spread of the disease in my company was as follows: A few cases had occurred at Camp Black shortly before departure. Men who had been ill braced up in order to go with the regiment to Camp Meade. It was a hard trip. One case (an artificer) developed on the train, and another (a quartermaster-sergeant) came down immediately after arriving at Meade. The nights were cold (at Camp Meade); tent floors were not furnished for all; during the first few days the men had but one blanket apiece, and no overcoats. The men, consequently, caught cold, and the fever, which might otherwise have been resisted, developed into typhoid or malaria.

Capt. William W. Bennett, commanding Company K, furnished a list of his men as they were grouped in their tents at Camp Black, and another as they were grouped at Conewago, the grouping at Camp Meade being substantially the same as at Camp Black, except as to vacancies. He stated substantially as follows: The order of the companies at Camp Black was: A, B, C, and G; E, K, I, and D; F, H, L, and M. Their order at Camp Meade was: A, I, M, and E; C, D, H, and G; B, F, L, and K. The order at Conewago was: C, D, H, and G; B, F, L, and K; A, I, M, and E.

This company was not upon any detached service.

The men of the company were chiefly from a rural population, with intelligence medium. They did not, in my opinion, take proper care both as to personal conduct and habits affecting their health, and their financial status was below the average.

The average of typhoid-fever cases in our regiment was about the same in all companies.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

September.—(Camp Black, N. Y., and Camp Meade, Pa.) Mean strength averaged for nineteen days: Officers, 43; enlisted men, 1,158; total, 1,201. Admitted from command, 294; total to account for, 294. Of 294 completed cases, 31 returned to duty; 263 transferred to other hospitals. Remaining on sick report in quarters, 306.

Abstract of remarks by Lieut. Abraham L. Haines, surgeon in charge:

This report commences September 12, the day that the regiment arrived at Camp Meade, Pa., to join the Second Division, Second Army Corps.

Cases marked "Time of observation too short for diagnosis" were all cases of suspiciously high temperature sent immediately to Second Division Hospital, where most of them developed typhoid fever.

From the time of the first appearance of the fever at Camp Black, Long Island, each company street was visited morning and evening and the temperature taken of every man showing any indication of malaise.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 32; enlisted men, 740; total, 772. Admitted from command, 144; total to account for, 144. Of 144 completed cases, 56 were returned to duty; 69 were transferred to other hospitals; 19 were otherwise disposed of. Remaining on sick report, in quarters, 306; in hospital, 28.

Maj. Burton Booth, surgeon, makes no remarks.

November.—(Camp Meade, Pa., and Camp Wetherill, S. C.) Mean strength averaged for thirty days: Officers, 44; enlisted men, 1,076; total, 1,120. Remaining from last month, 13; admitted from command, 37; total to account for, 50. Of 45 completed cases, 33 returned to duty; 10 were transferred to other hospitals; 2 were otherwise disposed of. Remaining on sick report, in quarters, 211; in hospital, 6.

Abstract of remarks by Lieut. Abraham L. Haines, surgeon in charge:

From November 1 to November 11, at Camp Meade. From November 13 to November 30, at Camp Wetherill, S. C.

December.—(Camp Wetherill, S. C.) Mean strength averaged for thirty-one days: Officers, 43; enlisted men, 1,054; total, 1,097. Remaining from last month, 5; admitted from command, 469; total to account for, 474. Of 446 completed cases, 419 returned to duty; 27 were transferred to other hospitals. Remaining on sick report, in quarters, 22; in hospital, 6.

Maj. Abraham L. Haines, surgeon, makes no remarks.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE TWO HUNDRED AND THIRD NEW YORK VOLUNTEER INFANTRY.

Brief outline of the medical history.—This second-call regiment was mustered at two points simultaneously—eight companies at Syracuse, N. Y., and four companies at New York City. Each company proceeded to Camp Black as soon as mustered. The mustering began on the 5th of July and ended about the 20th of the month. The first company reached the State rendezvous at Camp Black, Long Island, about the 9th of July and the last one about the 22d of July, 1898. Previous to the occupation of Camp Black by the Two hundred and first, the Two hundred and second, and the Two hundred and third New York Volunteer

Infantry Regiments, according to the assistant surgeon in charge of the Two hundred and third New York, twelve first-call New York regiments had preceded them in occupying that camp. (See note on this subject in our brief historical outline of the Two hundred and first New York.) The same medical officer declares that the Fourteenth New York Regiment Volunteer Infantry had previously occupied the greater part of the camp site of the Two hundred and third at Camp Black. He says: "The camp of the Two hundred and third was not placed exactly upon the site of that of the Fourteenth (New York), but was shifted a little south of the latter, so that the line of sinks (latrines) of the Two hundred and third ran along about the line of the kitchens of the Fourteenth." The camp of the Two hundred and third New York was on the highest ground, the artillery organizations being east of it, and the camp of the recruits of the Seventy-first New York Volunteer Infantry and that of the Two hundred and first being on lower ground to the west. (See general sketch map of Camp Black in August.) The Two hundred and third New York remained in this camp until the 11th of September, when it started by rail for the national camp in Pennsylvania. On the 12th of September the command arrived in Camp Meade, Pa., was assigned to the First Brigade, Second Division of the Second Army Corps, as at Camp Meade, and went into camp with the Second West Virginia and Fourth New Jersey, the other members of this brigade, which reached the national camp direct from their State camps. It should be noted, however, that the Fourth New Jersey did not reach Camp Meade until the 9th of October, after the segregation of the Two hundred and third New York. (The One hundred and fifty-ninth Indiana, Twenty-second Kansas, Third New York, and Eighteenth Pennsylvania, all except the last from Camp Alger, were attached to this brigade under orders for muster out. See histories of these regiments under Camp Alger.) In consequence of the great prevalence of typhoid fever in the Two hundred and third New York it was removed from Camp Meade on the 2d of October and isolated on suitable ground near the small railroad station of Conewago, 8 miles from Camp Meade. The regiment remained in this isolation camp until the 11th of November, when it started by rail for Camp Wetherill, near Greenville, S. C., reaching there on the 13th. It was still in this camp on the 31st of December, 1898, and it was mustered out of the service of the United States March 25, 1899, at Greenville, S. C.

The medical history of this regiment, as given by the board, covers a period, therefore, of five months and twenty-two days. Of this time, sixty-four days were spent at Camp Black, Long Island; sixty days at the national camp in Pennsylvania, of which twenty days were in Camp Meade and forty days in the isolation camp,

and forty-eight days in Camp Wetherill, near Greenville, S. C.

During the time of its stay in the State rendezvous at Camp Black the Two hundred and third New York had a most disastrous experience with typhoid fever—no less than 376, according to the estimate of the board, becoming infected before the departure of the regiment from Camp Black. We also estimate that there were only 129 men in the regiment after that most widespread infection who were infected with typhoid fever after arrival at Camp Meade, Pa., one of whom may have been infected after the departure of the regiment for the national camp in the South. The great epidemic of typhoid fever in this regiment was therefore entirely extinguished before it moved to Camp Wetherill, in South Carolina. In considering the origin of this epidemic of typhoid fever it is well to have in mind several important points elicited in the preceding testimony of medical officers of the regiment. The testimony of the medical officers of the Two hundred and first and Two hundred and second New York relative to conditions at Camp Black may also be consulted. Moreover, as having a possible bearing, the histories of certain first-call regiments which were at Camp Black in the month of May should be referred to, and of these especially that of the Fourteenth New York, which is said to have then occupied a part of the identical site upon which the Two hundred and third was later encamped.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained. For details of the method and system of examination, nomenclature, and classification pursued in these tabular statements we would refer to the introductory remarks at the commencement of the Second Army Corps at Camp Meade, Pa.:

[Two hundred and third New York Volunteer Infantry; mean strength, 1,047.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Total probable typhoid, including long malaria.	Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.		Typhoid.	All other.
July.....	28	5	1	34	6	.....	3	.....	3	.....	.....
August.....	118	5	.....	123	45	14	32	83	129	1	.....
September.....	3	1	1	5	116	9	58	229	296	7	.....
October.....	.....	1	1	2	6	12	13	57	72	8	1
November.....	1	1	.....	2	.....	.....	3	2	5	.....	.....
December.....	34	6	.....	40	1	.....	.....	.....	.....	.....	.....
Total.....	184	19	3	206	174	25	109	371	505	16	a2

a One other death in January, 1899, included in above total of 2.

A rectification of the total number of so-called long malaria, etc., as given in the above summary table, should be made by reducing the total of 25 to 23, thus requiring a corresponding reduction of the number of total probable typhoid-fever attacks from 505 to 503.

The above tabulated deaths by disease by months were distributed among the companies as follows:

	Company.										Total.
	A.	B.	C.	D.	E.	G.	H.	I.	K.	M.	
Typhoid	1	1	4	1	1	1	1	3	2	2	16
Other diseases	1			1							2
Total	2	1	4	1	1	1	1	3	2	2	18

N. B.—The death in Company A by "Other disease" occurred in January, 1899.

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such other attacks.

Intestinal disorders in the Two hundred and third New York.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Single short diarrhea	8	3	4	4	9	6	13	2	4	5	15	13	86
Two attacks short diarrhea	1				2	1			1		1	2	8
Short and long diarrhea			1		1								2
Single long diarrhea	2				1	2		1	2				8
Long and short diarrhea										1			1
Single prolonged diarrhea											1		1
Total diarrhea	23	6	11	13	25	21	22	5	17	10	25	28	206

Totals include diarrhea in malaria and typhoid combinations.

Combinations of continued or malarial fever in the Two hundred and third New York.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Short malaria (uncombined)	15	15	8	10	1	3	8	10	9	5	10	8	102
Short malaria preceded by diarrhea		1	1	1		2	3			1		1	13
Short malaria followed by diarrhea		1			1		1		1	1	1		6
Two attacks short malaria preceded by diarrhea	1			1									2
Short malaria preceded and followed by diarrhea				1									1
Two attacks short malaria	2	1		1					1		1		6
Short and long malaria	1												1
Long malaria (uncombined)	6	3			1	1		1	3				15
Long malaria preceded by diarrhea	1	1									1	1	4
Long malaria preceded and followed by diarrhea	1												1
Long and short malaria				1									1
Two attacks long malaria	1												1
Total short malaria	23	20	10	21	4	6	17	13	17	14	17	12	174
Total long malaria	11	4		1	2	1		1	3		1	1	25

Totals include malaria in typhoid combinations.

Combinations of typhoid fever in the Two hundred and third New York.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Certain typhoid (uncombined)	22	26	35	30	30	14	28	19	21	22	25	23	297
Probable typhoid (uncombined)	4	13	7	6	9	4	2	7	7	10	9	11	89
Typhoid beginning in diarrhea		1	1					2				1	5
Typhoid preceded by diarrhea	6			1	5	4	3	4	1	3	1	2	35
Probable typhoid preceded by diarrhea	2					3	2			1		2	11
Typhoid followed by diarrhea				3			2		1		2		8
Probable typhoid followed by diarrhea							1				1	1	3
Typhoid preceded by malaria				1	4	1	1	3	2	4	7	1	24
Probable typhoid preceded by malaria	1							1				1	4
Typhoid followed by malaria								1					1
Combinations of three diseases						1		1			1		3
Total certain typhoid	28	27	41	39	35	20	36	26	28	32	28	29	371
Total probable typhoid	7	13	7	6	13	7	3	7	8	11	13	14	109
Total probable and certain typhoid	35	40	48	45	48	27	39	33	36	43	41	43	480

The records of sickness in this regiment were found to be very incomplete and to some extent conflicting. By way of illustration: Although the regiment began to assemble in the State camp July 10, there was no monthly sick report from it on file earlier than for the month of September. Furthermore, there were 31 cases of so-called short malaria, etc., whose final disposition was not recorded. How many of these were really typhoid fever and should have been added to the number of total probable typhoid-fever attacks in the summary table above given, it was of course impossible for us to determine. That there were some, possibly many, we think can not be reasonably questioned. Moreover, there was a fatal attack of typhoid fever of which the only record of illness we have found was the death return on file in the office of the Adjutant-General. The foregoing tabular statement of sickness should therefore be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Two hundred and third New York Volunteer Infantry as a member of the First Brigade and Second Division of the Second Army Corps, as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(*a*) The regiment was in Camp Black, the State camp near Hempstead, Long Island, from July 10 to September 11; it was in the national camp, Camp Meade, Pa., from September 12 to October 2, when, on account of a widespread epidemic of typhoid fever in the regiment, it was moved to an isolation camp about 8 miles distant; it was in this isolation camp near Camp Meade, Pa., from October 2 to November 11; it was in the national camp, near Greenville, S. C., from November 13 to

December 31, 1898; and it was mustered out at Greenville, S. C., March 25, 1899. The initial date of the first attack of probable typhoid fever was July 27, of the first certain attack of typhoid fever was August 4. Typhoid fever made its first appearance in this regiment on the 27th of July; it gradually and rapidly developed in epidemic form until it left Camp Black for the national camp in Pennsylvania, where it soon reached its acme and began to decline. The medical history as given by the board covers a period of five months and twenty-two days (from July 10 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 206; of so-called short malaria, etc., 174; of so-called long malaria, etc., 23; of probable typhoid fever, 109, and of certain typhoid fever, 371. Total attacks of probable typhoid fever (long malaria, etc., included), 503.

(c) Total deaths from typhoid fever, 16; total deaths from all diseases, 18; mortality per cent of total probable typhoid-fever attacks, 3.18; of certain typhoid-fever attacks, 4.31; per cent of typhoid-fever deaths to total deaths by disease, 88.88.

(d) The mean strength was 1,047. The per cent of typhoid-fever morbidity to mean strength: As to total probable attacks of typhoid fever was 48.09, while the average for the brigade was 21.38; as to total certain typhoid attacks was 35.43, while the average for the brigade was 14.22. The number of typhoid deaths per 1,000 of mean strength was 15.28, while the average for the brigade was 9.01, and the average for the division was 8.78.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died from typhoid fever, and we have obtained the following figures as to the Two hundred and third New York:

Disease.	Individuals.	Average age.
Short intestinal disorders.....	17	22.4
Long intestinal disorders.....	2	29.5
Prolonged intestinal disorders.....	2	21.0
Total intestinal disorders.....	21	23.0
Short malaria, etc.....	34	24.0
Long malaria, etc.....	2	21.5
Probable and certain typhoid attacks.....	279	23.2
Total probable and certain typhoid and long malaria.....	281	23.2
Grand total of all above classes.....	337	23.3
Eight soldiers who died from typhoid fever.....		24.2

For comparison of these average age figures with similar data relative to other regiments in this brigade and division we refer to the general tables treating of this subject at the end of the Second Army Corps, at Camp Meade, Pa. (See also similar tables relating to the regiments of the Second Division of the Seventh Army Corps, at Jacksonville, Fla.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) The dissimilarities in the course of company epidemics in the Two hundred and third New York, as shown by the foregoing tabular statement and by the graphic chart, would appear to be, upon their face, incompatible with the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means of propagation of these epidemics. Reference to the graphic chart gives ample evidence of this truth, and it is unnecessary to illustrate it further by entering into details here. It appears that the arrangement of companies in the State camp of the regiment at Camp Black, near Hempstead, Long Island, was from east to west, as follows: M, H, L, F; D, I, K, E; G, C, B, A.

(b) The company epidemics have frequent greater or less exacerbations in their course, and the intervals between these exacerbations are, as a rule, closely coincident with the average period of incubation of typhoid fever. An examination from this standpoint of the foregoing tabular statement and of the graphic chart will more or less definitely substantiate this declaration.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) Attention should be recalled here to the remarks of Lieutenant Burgess, the surgeon in charge of the Two hundred and third New York, and of other medical officers on duty in this State camp at Camp Black, Long Island, concerning the early history of typhoid fever in that camp, especially the statement made with regard to the recourse of two companies, A and E, of the Two hundred and third New York to a certain surface well during the intervals of drill while in the neighborhood of that well. The suggestion is advanced by the officers alluded to of the probability of specific infection from the water of this well and the explanation thus given of the origin of typhoid fever in these two companies. Reference to the graphic chart shows the existence of a number of cases of typhoid fever in Company I anterior to the sudden development of the epidemic in Company E, so that it can scarcely be claimed that Company E was the first one of the regiment to become infected with typhoid fever. It has been suggested by the surgeon in charge of the Two hundred and first New York (see his testimony) that the company first affected with typhoid fever in Camp Black among the New York regiments of the second call was one which came from Sacketts Harbor, where typhoid fever existed in an epidemic form. Whether this company of the Two hundred and third New York from Sacketts Harbor was Company I or not we are unable to state definitely. It should also be remarked in this connection that Company M experienced a case



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graph TD
    A[1ST CAV DIV] --> B[EQ 100]
    A --> C[SQUADRON]
    A --> D[POST OFFICE]
    A --> E[MAJOR BURDEN]
    C --> F[CAPT]
    E --> G[COLONEL]
    A --> H[CHAPLAIN]
    H --> I[STEWARDS]
    H --> J[ASST SQUADRON]
    H --> K[ASST SUPERVISOR]
    I --> L[QUARTERMASTER]
    J --> M[LT COLONEL]
  
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☐ OFFICER'S
MESS

DIRECTION TO SUPERFICIAL WELL

☐ OFFICERS' SINK

TO COMMISSARY HEADQUARTERS

DIRECTION OF SUSPECTED WELL.

of typhoid fever anterior to the date of the outbreak of the epidemic in Company E, as did also Company H. It may be surmised, however, in regard to this suspected well in connection with the origin of typhoid fever in the Two hundred and third New York, that what little evidence we have been able to obtain bearing upon this matter appears to confirm the suspicion that a pollution of this well may have played a very important if not the chief rôle in the rapid dissemination of typhoid fever among a number of different companies of the various commands of the second call at Camp Black.

SPECIAL CHARACTERISTICS OF CERTAIN COMPANY EPIDEMICS AS EXHIBITED BY GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN TENTS, VIEWED FROM THE STANDPOINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) We have endeavored to ascertain the names of soldiers as they were grouped in their tents through the period of three encampments of this regiment at Camps Black, Meade, and Conewago, respectively, in order to examine into this important question as closely as possible. To this end we requested such data from two different sources, namely, from the regimental surgeon and from the commanding officers of companies. The regimental surgeon in response to this request furnished diagram maps of each of the above-mentioned camps with the number of attacks of typhoid fever in their respective company tents indicated by arabic numerals. These diagram maps were accompanied by corresponding lists of men, giving name, rank, and date of commencement of the attack. From the data furnished by the regimental surgeon we have constructed two diagrams, which accompany this text. The one representing the regimental camp at Camp Black, whereon is plotted by black dots the number of attacks of typhoid fever which developed in the respective tents during that encampment, the other representing the camp of the regiment at Camp Meade, near Middletown, Pa., whereon is similarly plotted the attacks of typhoid fever which developed at that camp. The surgeon of the regiment furnished, as has been stated, a plot of the isolation camp of the regiment at Conewago, Pa., likewise showing the number of attacks of typhoid fever developed in tents during that encampment, but we have not reproduced that diagram here. Reference to these diagrams shows the manner in which the attacks of typhoid fever were grouped with regard to certain tents. These squad groups of the sick, as plotted in their tents, would seem to be incompatible with the assumption that the chief factor in the propagation of typhoid fever throughout the companies of this regiment may have been some agency whose influence was common and pretty constantly acting upon the whole command; on the contrary, they would appear to suggest a mode of disseminating infection which

more effectively reached and acted upon certain limited groups of men while it passed by others, which would be entirely compatible with the assumption of a dominating tent, squad, or comrade infection. This seems to hold true of any company epidemic which persists for any considerable time, whatever may have been the original mode of infection, whether a water infection, for example, or otherwise. Even after a general water infection, in the course of the subsequent epidemic, a mode of propagation of the infection sooner or later becomes dominant, which by its characteristics is entirely compatible with the assumption of a tent, squad, or comrade infection.

Speaking of the diagrams above mentioned, it may be interesting to state that an analysis of the first one, representing the encampment of the regiment at the State camp, Camp Black, where the command became widely infected with typhoid fever, shows that there were altogether 180 attacks of typhoid fever plotted in the tents; of these, 104, or 57.77 per cent, occurred in the half of the camp nearest the latrines. An analysis of the second diagram, representing the encampment at Camp Meade, near Middletown, Pa., shows that there were 220 attacks of typhoid fever developed during this camp, which are plotted in their respective tents; of these, 123, or 55.90 per cent, were developed in the half of the camp nearest the latrines, while 97 attacks, or 44.09 per cent, developed in that half of the camp most remote from the latrines. We may state with regard to the isolation camp of this regiment at Conewago, 8 miles from Camp Meade, Pa., that the surgeon's diagram of this camp shows 72 attacks of typhoid fever developed during that encampment plotted in their respective tents; of these, 47, or 65.28 per cent were developed in the half of the camp nearest the latrines, while 25, or 34.72 per cent were developed in the half most remote from the latrines. It should be stated, however, that in this instance the distance of the latrines from the nearest company tents was 650 feet. Summarizing these figures with regard to the three camps, we have 472 total cases of typhoid fever plotted, of which 274, or 58.05 per cent, were in the half of the camps nearest the latrines, while 198, or 41.95 per cent, were in the half of the camps most remote from the latrines. It should be stated with regard to these diagram maps, in which the attacks of typhoid fever are plotted in their respective tents, that in the State camp of the regiment at Camp Black the average number of men in a tent was four, while in the national camp at Camp Meade the aggregate number of men occupying the tents of the regimental camp was necessarily less than in Camp Black by 180, the number of typhoid-fever attacks which developed at the latter camp. In addition to the foregoing data furnished by the surgeon of the regiment, commanders of Companies A, C, and K of the Two hundred and third New York also independently furnished data, which, when analyzed

by the board, were seen to harmonize very closely with the data furnished by the regimental surgeon as to the points in consideration.

(b) A further indication of the existence and active influence of a tent, squad, or comrade infection throughout this command is the following result of a careful analysis we have made of the records of sickness in this regiment in connection with the grouping of infected men in their tents and the average time elapsing between successive or "connectable" attacks in the same tent or in adjoining tents. As deduced from the surgeon's tent list, we find that among 467 attacks of typhoid fever plotted in tents, 234, or 50.10 per cent, were separated or "connectable" by periods which could fairly be regarded as measuring the average period of incubation of typhoid fever. As deduced from the tent lists furnished by three captains, we have found that among 154 attacks of typhoid fever plotted in their tents, there were 101, or 65.58 per cent, separated or "connectable" by periods which could fairly be regarded as measuring the period of incubation. (For further details concerning this matter, refer to the tables showing number and per cent of "connectable" attacks of typhoid fever in tents as deduced from the surgeons' and from the captains' tent lists of certain regiments of the Second Army Corps at Camp Meade, Pa., and regiments of the Second Division, Seventh Army Corps, at Jacksonville, Fla.)

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation of this disease from data obtained from two different sources, and we have found a striking coincidence in the general averages of the figures thus obtained.

(a) Period of incubation as deduced from the length of intervals between "connectable" attacks of typhoid fever occurring in the same and in adjoining tents. As deduced from the surgeon's tent lists, among 467 attacks of typhoid fever plotted in the tents, we found 142 intervals which could fairly be regarded as measuring the period of incubation in typhoid fever. These 142 intervals averaged 10.4 days. As deduced from the tent lists of company commanders, among 154 attacks of typhoid fever plotted in their tents, we have found 71 intervals which could fairly be regarded as measuring the average period of incubation in typhoid fever. These 71 intervals averaged 10.4 days.

(b) Period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid-fever attacks. The two hundred and third New York furnished six examples of diarrhea preceding typhoid fever by intervals which could fairly be regarded as measuring the incubation period of typhoid fever. The intervening period between the attacks in these six examples averaged 8.6 days.

FIFTH MASSACHUSETTS VOLUNTEER INFANTRY. Second Brigade, Second Division, Second Army Corps, Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. Charles C. Foster, surgeon.]

South Framingham, Mass.—The muster of the regiment was completed on the 2d of July and the command remained in the State camp ten weeks.

The water supply was that established several years ago for the State encampment. It was from a small pond half a mile from the camp, from which the water was pumped to a standpipe and thence distributed throughout the camp. The water was tested by the State board of health and found to be excellent. There was a possibility of contamination, but this was prevented by establishing a guard down near the small pond.

The method of disposal of feces was as follows: The State had built brick sinks, which were emptied by means of a regular night-soil car and by the professional night-soil man. This brick sink was covered over slightly twice a day with dirt and a disinfectant of one kind or another, and the emptying was done by shoveling, not by pumping, for on account of mixture with the dirt there was seldom fluid enough to use a pump. "I disliked the system because the sinks had been in use for a number of years and the ground there must have become infiltrated." The smell while emptying these sinks was fearful. There was no trouble with flies, the sinks being dark and covered over by a trap-door.

The mess tents were distant from these sinks quite 125 feet.

There was very little typhoid fever while encamped at South Framingham. There was one case which developed about the middle of August, in a man who became ill a little over a week after returning from leave of absence. This man was promptly removed from the command as soon as the surgeon became suspicious, and he was kept in a town hospital several weeks.

Camp Meade, Pa.—The regiment arrived at Camp Meade on September 11 and went into camp near to and behind the Two hundred and first New York Volunteer Infantry.

The pit system for the disposal of feces was employed at Camp Meade, each individual being required to cover his own excrement immediately. The sinks were also limed every day, and care was taken to throw the lime against the sides of the pit.

The men were in tents of about 10 or 12 feet, six men to a tent, and upon floors. Every blanket is exposed to the sun every day, except when it rains, and once a week the floors are tilted up for airing.

For some time past the regiment has been furnished from the general water supply. Previously the water was hauled in barrels. At the present time we are

using Pasteur filters issued by the Government in connection with the Maignen filters, the water being first passed through the Maignen and then through the Pasteur filters. The small Berkefeld filters are not in general use, for it is impossible to get enough through one for the use of 100 men. One of them, however, is being used for hospital headquarters and for the guard. One of the Pasteur filters is made to serve for two companies. The water issuing from the Pasteur filters goes directly into large wash boilers, which are raised upon tables. Upon filling, their covers are fastened down and the men draw off the water through spigots. The men take this water readily, but they often, however, go direct to the hydrants in connection with the water mains and take the hydrant water in preference to that which has been standing and become warm from exposure to the sun. The Pasteur filters are worked by a detail, one man per filter. Their duty is to run them and keep them in order.

Since arriving at Camp Meade three cases, probably typhoid fever, have occurred, the first man being a corporal of Company B, the second a private of Company F, and the third a musician who messed with Company F. The man from Company B became ill a week or so after he had returned from home, where he had been on leave of absence. The other two men have been with the regiment since arriving at Camp Meade about three weeks ago. (This testimony was taken about October 6.)

Questioned as to whether in his opinion there was more or less typhoid around Camp Meade, Major Foster stated that all the towns along the river (Susquehanna) have steady complaint of typhoid fever. They have lots of it.

ABSTRACT OF A COMMUNICATION FROM THE COMMANDER OF COMPANY I, FIFTH MASSACHUSETTS VOLUNTEER INFANTRY.

Camp Meade, Pa.—Capt. George H. Sykes, commanding Company I, furnished a partial list and stated substantially as follows: I have the honor to submit the following in response to the questions asked in regard to my company at Camp Meade. In reply to the first question regarding the grouping of the men and the tents they occupied, I send you the list as near as I can get to it. It will probably answer as well as a complete list, since it has the names of all the men who had typhoid fever while in the service (three men named). The first of these was taken sick on the train en route for Greenville, S. C., from Camp Meade. The last man named was taken sick at Greenville shortly after he left Camp Meade.

The order of the company letters (of the Second Battalion) at Camp Meade, commencing at the right, was I, D, K, H.

During our encampment at Camp Meade the Second Battalion, comprising the above-named companies, was

detailed for special duty at the commissary depot from September 29 to November 16, on which date we left for Greenville, S. C. During our detail at the commissary depot we were first located in an open field of rather low ground, after which we were removed to higher land 100 yards away.

My company came chiefly from an urban population. The average intelligence of the men was medium. The men were reasonably prudent as to personal conduct affecting their health.

This company suffered very little from typhoid fever. The tent floors were raised frequently, and below and around them the earth was thoroughly limed.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORT.

July.—(South Framingham, Mass.) Mean strength averaged for thirty-one days: Officers, 45; enlisted men, 1,252; total, 1,297. Admitted from command, 213; total to account for, 213. Of 210 completed cases, 209 returned to duty and 1 was discharged. Remaining on sick report, 3.

Abstract of remarks by Charles C. Foster, major and surgeon:

The health of the regiment was excellent, only one serious case (appendicitis) occurred, resulting in recovery. Most cases were either digestive disturbances or the result of vaccination (sore arms). The whole command was thoroughly vaccinated. No civilian reported sick.

August.—(South Framingham, Mass.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,268; total, 1,315. Remaining on sick report from last month, 3; admitted from command, 142; total to account for, 145. Of 136 completed cases 134 returned to duty; 1 was discharged; 1 transferred to other hospital. Remaining on sick report, 9.

Abstract of remarks by Charles C. Foster, major and surgeon:

Prevailing disease, acute diarrhea. Measures adopted for prevention, supervision of rations and meal inspection three times daily. One sporadic case of typhoid fever, contracted when on furlough. No others followed it. Isolation and enteric precautions were adopted to prevent its spread.

September.—(South Framingham, Mass., and Camp Meade, Pa.) No data given.

Abstract of remarks by Frederick Pearl, major and surgeon:

Command was sent to Camp Meade, Pa., September 11, arriving there September 12. The first case of typhoid fever developed September 28. This was the first of a series of 24 cases, all of which are due to new environment—contact with other commands badly infected. Isolation, enteric precautions, and supervision of the milk and water supply were the measures adopted to prevent its spread. A talk was given the men as a body, telling them of its possible sources, methods of infection, and ways of conveyance of typhoid fever. Supervision of latrines and insistence on covering all fecal matters in the latrines were also adopted. At this time water was not filtered and milk was not boiled, assurance being given that neither was infected.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 44; enlisted men, 1,236; total, 1,280. Remaining on sick report from last month, 20; admitted from command, 178; total to account for, 198. Of 182 completed cases, 151 returned to duty, 1 died, 26 were transferred to other hospitals, 4 were otherwise disposed of. Remaining on sick report, 16.

Abstract of remarks by surgeon:

The development of 10 cases of latent malarial intermittent fever in one company coming from Waltham, Mass., a malarial region on the Charles River, is interesting. Twenty-three cases of typhoid fever entered the hospital, all contracted at this station. Means taken to prevent spread were careful isolation and enteric precautions in all cases, sending the cases at once to division hospital. All water used was first passed through Maignen and Pasteur filters as it was voided. Since October 20 all milk used by this command has been boiled, and since that time fever cases have developed. Type of disease, mild. The one death, and only one, since mustering in of command June 20 was a case of typhoid fever which developed pneumonia after going through the division hospital and being transferred to Woman's Hospital, Philadelphia.

November.—(Camp Meade, Pa., and Camp Wetherill, S. C.) Mean strength averaged for thirty days: Officers, 44; enlisted men, 1,228; total, 1,272. Remaining on sick report from last month, 16; admitted from command, 106; total to account for, 122. Of 105 completed cases, 87 returned to duty and 18 were transferred to other hospitals. Remaining on sick report, 17.

Abstract of remarks by surgeon:

Prevailing diseases, affections of the respiratory system, bronchitis, and 2 cases of lobar pneumonia. Sixty cases of acute congestive nephritis have occurred since the oncoming of cold weather. Thirty-two cases of typhoid fever have occurred in the past five months, 28 at Camp Meade and but 4 cases at Camp Wetherill.

December.—(Camp Wetherill, S. C.) Mean strength averaged for thirty-one days: Officers, 44; enlisted men, 1,211; total, 1,255. Remaining on sick report from last month, 16; admitted from command, 343; total, 359. Of 327 completed cases, 315 returned to duty and 11 were transferred to other hospitals. Remaining on sick report: In quarters, 26; in hospital, 7.

Abstract of remarks by Frederick Pearl, major and surgeon:

The health of the command has been good. The large number of sick cases was due to an epidemic of influenza, coincident with that which existed along the whole eastern seaboard. The attacks lasted seventy-two to ninety-six hours and were characterized by much muscular pain and temperature ranging from 101° to 104° F. All terminated favorably, being followed by a bronchitis and weakness extending four to six days.

The infectious and contagious nature of the disease was clearly shown by its spread in tents, squads, and companies.

Neither isolation nor attempt to prevent spread was tried.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FIFTH MASSACHUSETTS VOLUNTEER INFANTRY.

Brief outline of the medical history.—In response to the second call for volunteers this regiment assembled at the State camp, near South Framingham, Mass., by the 20th of June, 1898; the muster was completed by

the 2d of July, and the command remained in the State camp until the 11th of September, when it started by rail for the national camp in Pennsylvania. It arrived at Camp Meade, Pa., the 12th of September, was assigned to the Second Brigade, Second Division, of the Second Army Corps, and went into camp with the Two hundred and first New York—the other member of this brigade arriving direct from its State camp. (The Fourth Missouri, which had previously been at Camp Alger, Va., was also a member of this brigade, and the Seventh Illinois, Sixth and Sixteenth Pennsylvania, likewise from Camp Alger, were for a time attached to this brigade at Camp Meade under orders to be mustered out. See histories of these regiments, under Camp Alger.) The Fifth Massachusetts remained at Camp Meade until November 16, when, following the Two hundred and first New York, it started by rail for Camp Wetherill, near Greenville, S. C. It was still at the latter camp on the 31st of December, and it was not mustered out of the service of the United States until the 31st of March, 1899, at Greenville, S. C.

The medical history of this regiment as prepared by the board covers a period of six months and ten days. Of this time, seventy-three days were spent in the State camp, sixty-five days at Camp Meade, Pa., and forty-five days at Camp Wetherill, near Greenville, S. C.

The surgeon of this regiment speaks of the presence of a small amount of typhoid fever while at the State camp, and the following record in detail shows the occurrence of four attacks before the departure for the national camp in Pennsylvania. Hence there can be no doubt that the Fifth Massachusetts brought with it to Camp Meade the infection of typhoid fever. The epidemic which followed was practically ended before the command left Camp Meade for the national encampment in South Carolina.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for the easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks are recorded as closely as they could be ascertained.

[Fifth Massachusetts Volunteer Infantry, mean strength, 1,275.]

Month.	Intestinal disorders				Febrile attacks, malaria, etc.		Typhoid attacks.		Total probable typhoid, including long malaria	Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.		Typhoid	All other.
July.....	44	2	.....	46	7	.....	.....	.....	3	.....	.....
August.....	60	2	1	63	13	.....	2	1	6	10	.....
September.....	66	1	.....	67	33	4	.....	6	34	1	.....
October.....	33	4	.....	37	46	5	4	25	5	10	1
November.....	.....	.....	.....	.....	7	2	3	5	10	1	.....
December.....	6	.....	.....	6	6	2	1	6	9	1	.....
Total.....	209	9	1	219	112	13	10	43	66	3	.....

The above tabulated deaths from disease, by months, were distributed among the companies as follows:

	Company.			Total.
	D.	E.	G.	
Typhoid.....	1	1	1	3

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been studying) and (*b*) who have had such other attacks:

Combinations of typhoid fever in the Fifth Massachusetts.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	1	6	3	6	1	4	5	2	3	4	3	1	.....	39
Probable typhoid (uncombined).....	2	2	1	.....	1	1	1	1	.....	.....	.....	.....	.....	9
Typhoid preceded by diarrhea.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Typhoid preceded by malaria.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1
Total certain typhoid ..	2	7	3	7	1	4	5	2	3	4	3	2	.....	43
Total probable typhoid.....	2	2	1	.....	1	2	1	1	.....	.....	.....	.....	.....	10
Total probable and certain typhoid....	2	9	5	8	1	5	7	3	4	4	3	2	.....	53

Combinations of continued or malarial fever in the Fifth Massachusetts.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	12	3	2	4	5	19	4	5	5	8	6	9	.....	82
Short malaria preceded by diarrhea.....	2	1	1	1	2	.....	.....	.....	1	1	2	.....	.....	11
Short malaria followed by diarrhea.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Two attacks short malaria.....	.....	2	.....	.....	1	2	.....	1	1	.....	1	.....	.....	8
Long malaria (uncombined).....	1	.....	.....	.....	5	.....	2	1	1	.....	.....	.....	.....	10
Long malaria preceded by diarrhea.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Total short malaria.....	12	5	7	5	6	24	8	5	7	11	7	15	.....	112
Total long malaria.....	1	.....	.....	.....	6	.....	2	1	1	1	1	.....	.....	13

Totals include malaria in typhoid combinations.

Intestinal disorders in the Fifth Massachusetts.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea.....	16	12	23	14	12	14	19	11	17	8	15	10	.....	171
Two attacks short diarrhea.....	3	1	1	.....	.....	.....	.....	.....	3	.....	2	.....	.....	10
Single long diarrhea.....	.....	.....	2	2	.....	.....	2	.....	1	.....	.....	.....	.....	7
Long and short diarrhea.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Prolonged diarrhea.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Total diarrhea.....	23	19	26	18	15	18	20	14	23	10	17	16	.....	219

Totals include diarrhea in malaria and typhoid combinations.

The records of sickness in this regiment are somewhat incomplete. In this connection it may be stated that four cases were encountered whose final dispositions were not mentioned.

The salient points of the medical history (including morbidity and mortality) of the Fifth Massachusetts Volunteer Infantry, as a member of the Second Brigade,

Second Division of the Second Army Corps as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(*a*) The regiment was in its State camp near South Framingham, Mass., from June 20 to September 11; it was in the national encampment, Camp Meade, Pa., September 12 to November 16; it was in Camp Wetherill, the national camp near Greenville, S. C., from November 18 to December 31, 1898; and it was mustered out at Greenville, S. C., March 3, 1899. The initial date of the first case of probable typhoid fever was August 2 and of the first certain attack of typhoid fever was August 2. This regiment came to the national camp in Pennsylvania already bearing the infection of typhoid fever, but most of the cases of typhoid fever which this command experienced received their infection after reaching Camp Meade. The medical history as given by the board covers a period of six months and ten days (from June 20 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(*b*) Attacks of intestinal disorders, 219; of so-called short malaria, etc., 112; of so-called long malaria, etc., 13; of probable typhoid fever, 10, and of certain typhoid fever, 43. Total attacks of probable typhoid fever (long malaria, etc., included), 66.

(*c*) Total deaths from typhoid fever, 3; total deaths from all diseases, 3; mortality per cent of total probable typhoid attacks, 4.57; of certain typhoid attacks, 6.97; per cent of typhoid deaths to all deaths by disease, 100.

(*d*) The mean strength was 1,275. The per cent of typhoid morbidity to mean strength: As to total probable typhoid attacks was 5.17, while the average for the brigade was 10.10; as to total certain typhoid attacks was 3.37, while the average for the brigade was 6.89. The number of typhoid deaths per 1,000 of mean strength was 2.34, while the average for the brigade was 9.35 and for the division 8.78.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Fifth Massachusetts:

Disease.	Individuals.	Average age.
Short intestinal disorders.....	166	24.0
Long intestinal disorders.....	7	24.8
Prolonged intestinal disorders.....	1	27.0
Total intestinal disorders.....	174	24.5
Short malaria, etc.....	93	24.1
Long malaria, etc.....	9	26.2
Probable and certain typhoid attacks.....	45	23.4
Total probable and certain typhoid and long malaria.....	54	23.9
Grand total of all above classes.....	321	24.0
Three soldiers who died of typhoid fever.....	.....	24.0

For comparison of these average-age figures with similar data relative to other regiments in this brigade and division we refer to the general tables treating of this subject, at the end of the Second Army Corps at

Camp Meade, Pa. (See also similar tables relating to the regiments of the Second Division of the Second Army Corps at Jacksonville, Fla.)

TWO HUNDRED AND FIRST NEW YORK VOLUNTEER INFANTRY.

**Second Brigade, Second Division, Second Army Corps,
Camp Meade, Pa.**

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. William E. Spencer, surgeon.]

Camp Black, near Hempstead, Long Island.—The regiment was mustered in by companies at the armory of the Twelfth New York Regiment (New York City), and sent thence to Camp Black. "The regiment was organized of 'longshoremen and all sorts of men." The first company started for Camp Black about the 7th or 8th of July, 1898, and the others followed at short intervals. The entire regiment was assembled at Camp Black by the 28th of July or the 1st of August. The regiment remained at Camp Black until the 9th of September. Camp Black was not a State encampment, but was selected for mobilization of several volunteer regiments. It was out on Long Island, about 58 miles from New York City, on a very level plain with scarcely an elevation of 10 feet in 8 or 10 miles. After Major Spencer arrived at Camp Black the water supply of the camp was furnished from that of the town of Hempstead, being distributed in pipes. He had it examined about every week, and "there never was a typhoid bacillus in it." The standpipe of Hempstead was about 4 miles from camp, but there was an abundance of water. The men had shower baths, but no other bathing facilities.

Before Major Spencer arrived at the camp of the Two hundred and first it is believed the men of his regiment used largely shallow-well water, on account of its being clearer and cooler. There were driven wells, and there were a number of them scattered among the camps. They were about 16 feet deep. "All of the water comes from Connecticut and runs into the Atlantic. You get one water-bearing stratum at 16 feet, another at 30 feet, and another at 68 feet, which latter furnishes the best water in the country. These wells were driven for use of the camps. The sinks should have been to the south and the camp (with the wells) to the north; that is, they should have been just the reverse of what they are."

These shallow wells in question were closed, as has been stated, on the day or the day after Major Spencer arrived in camp, except one pump maintained at headquarters for the use of the stock. "I am confident that pump was used also by the Two hundred and third Regiment. It would be almost impossible to prevent those men from using the water, even if the pump were under lock and key. The reason why the men of that regiment resorted to this pump and the men of the Two hundred and first did not was that it was much nearer

to the camp of the Two hundred and third. The camps of the artillery were on the opposite side of that of the Two hundred and third. As has been stated, the shallow well between the Two hundred and third and the quartermaster's department was supposed to be continued in use for the stock only. Colonel Byrnes, however, was satisfied that the typhoid fever at Camp Black was picked up by men on provost guard who drank wherever they could. Furthermore, frequently men would go to wells and fill their canteens. Some of the men would fill ten or fifteen canteens at once from some well in the neighborhood. Colonel Byrnes seemed to have thought it beyond question that this was the cause of the infection. The water supply from Hempstead was frequently analyzed, analysis being made daily at Hempstead. I know of three or four analyses having been made—one at Binghamton, one at Albany, and I had one made by the New York board of health. As a result of these analyses nothing suspicious was found. I had inquired about the health of Hempstead. There was nothing abnormal about the health of that town. They always have more or less typhoid fever there. In fact, they have it all over Long Island. They claim, however, to have at Hempstead a perfect water supply. I believe they have, for analysis showed it."

The milk was watched. There was some irregularity and carelessness about it, but it was inspected as well as could be done and was tested at the hospital. There was no suspicion that could be verified as to the quality of the milk. "I believe Doctor Clinton traced one case to a well in the vicinity where a woman had had some diarrheal condition which had kept her in bed six weeks. This well was near a privy."

There was a report prevalent in Camp Black when the fever first developed there that a company of the Two hundred and third New York came from Sacketts Harbor, where there was quite an epidemic of typhoid fever existing. "I believe that another company had many in hospital after they got here, having left 40 cases behind them in post hospital when they went to Camp Meade." The general consensus of opinion was that the fever spread among the Two hundred and third New York chiefly because of the close proximity of cook shacks and sinks.

The method of disposal of fecal matter was by ordinary company sinks, dug from 6 to 8 or 10 feet deep. The soil was, at the top, for about 8 inches, a kind of peat, and down about 3 or 4 feet you got a coarse gravel; then came another layer of peat, and below that another layer of gravel, which diminished in the size of the grain down to that of sea sand, thus making a perfect absorbent material. No water stood in the sinks. The orders at Camp Black were to cover the contents of these sinks twice a day and sprinkle with lime. The fecal matter in the sinks was covered, after Major Spencer arrived at the camp, five or six times a day. The sinks were on the same side of the regiment

as the mess tents, the sinks nearest to the mess tents being about 200 feet distant. "There were no floors in the tents. The men would go off guard and lie down in their wet clothes (after rains), and it would upset their digestions and put them in good condition to receive typhoid fever."

The camp of the Two hundred and third New York was located about 500 yards from that of the Two hundred and first New York, and was upon higher ground—about 40 feet higher. All of the waste water of that regiment ran down into a hollow between us, and their drainage came within 200 yards of the camp of the Two hundred and first. The camp of the Two hundred and first was located at the foot of a declivity, the ground of four of the companies of the Two hundred and first being at times covered with the wash water from the pipes of the Two hundred and third New York. "We disinfected that and made a straight drain 300 yards and dug three enormous sinks for drainage about three weeks before we left Camp Black. The Two hundred and third improved that condition of things after we had practically forced them to do it. But we were there for weeks under these conditions, and it was said there was an infected company in that regiment from Sacketts Harbor; but our explanation of the typhoid fever of the Two hundred and third was that they had walking cases and that there was too close proximity of their cook shacks and sinks, the latter being in one instance within 40 feet of the mess tent and giving off a very noticeable odor. They also used well water from driven wells."

There was a good deal of diarrhea and indigestion in the Two hundred and first while at Camp Black.

Hempstead is in a malarial region. Sickness commenced while the regiment was at Camp Black. The first case of typhoid in the regiment was reported about the 23d or 24th of August. This case was from the first company of the regiment arriving in Camp Black, getting there about the 13th of July. There was a post hospital at Camp Black, and the sick were not retained in the camps of the regiments. For three weeks after arriving at Camp Black the sickness was very trifling. During this time there was not even an emergency case, and any drugs that were needed the steward obtained from the hospital. The typhoid fever developed all at once, just a few days before the regiment broke camp in order to be transferred to Camp Meade, Pa. It appeared in various companies, yet the cases would come in bunches of two or three from one company and skip over two or three companies without any cases at all. "I think there were two companies that had none." The Two hundred and third New York, above mentioned, had more fever than did the Two hundred and first, and they had it earlier than the latter. Major Spencer was of the opinion that not more than 7 cases of typhoid fever had developed in his regiment before it left Camp Black.

Camp Meade, Pa.—The regiment arrived at Camp Meade, Pa., on September 9. At first the water was hauled in barrels, but it is now piped from standpipes. Filters were issued to the command (Pasteur, Berkefeld, and Maignen), but their use was abandoned yesterday (testimony taken October 6, 1898), as the analysis of the water proved it to be good. The filters were all out of order.

Two dug pits as sinks for each company were used, one for excrement and the other for garbage. The regulations required that every man cover his own excrement. In addition to this the sinks were lined every day, and there was a guard stationed over each one. "I have not seen a fly there. The solid part of the garbage is burned in the kitchen fire; the fluid part is placed in the kitchen sink and covered."

Practically every man in the regiment has diarrhea and indigestion—more than at Camp Black. It follows malaria. Major Spencer was of the opinion that the regiment was suffering a good deal with malaria of the quotidian type. The cases yielded to quinine—plain chills and fever. "We have no hospital accommodations in the regiment, and you can not take care of a man in quarters except for a few days. We have therefore made it a rule to send these (malarial) cases to hospital. Some of them are still there; others remain in three or four days and are sent off on furlough. Our sick list is about 10 per cent, including those on sick leave and in hospital and in sick quarters. None of these have returned yet to the regiment. There is now a decided reduction of typhoid fever, though I do not think the same can be said of malaria. We had six or eight cases (a day) when we first arrived here, while yesterday there were only 3 cases sent in, and but 1 of them is suspected of being typhoid; the day before there were only 2 cases."

Major Spencer believed there had occurred about 200 cases of typhoid and an enormous number of malarias since arriving at Camp Meade. He believed the typhoid to be imported (from Camp Black). "We made it a rule to send to the division hospital any cases that had a temperature, abdominal pain, and malaise. I have been so busy that I could not follow them up. They have gone largely to the Second Division Hospital. There has been a peculiar condition as to the typhoid fever, the average percentage of fatal cases having been very great. I think our ninth death occurred yesterday. Cases of typhoid are still appearing. The cases I sent in day before yesterday I would look upon with suspicion. They had no eruption, but they presented the general indescribable, indefinite condition that precedes typhoid; yet the temperature curve was not typical, resembling that of malaria. I have a list from the division hospital which shows 14 cases diagnosed as typhoid, which agrees with our diagnoses, and 5 doubtful cases, a total of 19. But I am convinced that we have more cases than that, for I believe some

are sent to other hospitals." Major Spencer stated that he was still sending undetermined cases to hospital which he believed to be typhoid.

Company D was the one most infected, and Company E suffered next to this in intensity. But the typhoid is not confined to one or two companies. It is, however, almost impossible to follow the conditions of each company, because of assignments to provost duty and changes of surgeons and quartermasters. "We have a large number of cases of malaria that do not go to quarters. I have had men say they felt like fighting cocks while they were having a temperature of 104. Almost every case improves under quinine. Nearly all of them are on duty. They are men we simply prescribe for. We give them quinine; and if the man keeps improving, that is practically the end of it. On the other hand, we have cases where the temperature keeps up, and they will remain in quarters five or eight days, and then go to hospital, some of them developing typhoid fever. I know that modern scientists do not believe in 'typho-malarial' fever, but these cases answer the picture of that combination. As an example, two privates were in the same tent, with almost identical symptoms: both had slight abdominal tenderness, and one was constipated and the other had well-marked diarrhea. At the end of the second day they were still very similar cases, except the temperature of the one had shot up, causing his transference to the division hospital, where they gave a diagnosis of typhoid fever. The temperature of the other remained down, and he was not transferred."

When a man is transferred to division hospital his tent and blankets are aired; moreover, the tents throughout the command are aired regularly, and the tent floors are tilted and aired once a week. Besides, whenever the sun shines, blankets are aired daily until 11 o'clock in the morning. "We have endeavored to enforce every precautionary measure we can, and we feel we have succeeded fairly. We came here with next to the largest number of cases, and since our arrival have dropped to the third position among the New York regiments. The Two hundred and first, Two hundred and second, and Two hundred and third New York Regiments were at Camp Black together and remained there about the same length of time. During that same time there were three batteries of New York Volunteers at Camp Black, which suffered very little with typhoid fever. Yet they were on that ground longer and remained there after the above-named regiments left." The Two hundred and first was the first regiment to get away from Camp Black, and Major Spencer attributed the decreasing sickness of his regiment in part to the fact that they had four or five days' advantage over the other two regiments in getting away from their infected camp. Asked how he accounted for the artillery having less illness than the infantry at Camp Black, Major Spencer expressed the opinion that

it was due to the "better arrangements of their sinks. They had no (field) pieces, and their drill, in case of rain, was nothing. They had practically nothing to do except entertain themselves. They had practically the same water supply."

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

September.—(Camp Black, N. Y., and Camp Meade, Pa.) Mean strength averaged for thirty days: Officers, 26; enlisted men, 1,020; total, 1,046. Admitted from command, 230; total to account for, 230. Of 196 completed cases, 147 returned to duty, 1 died, 48 were transferred to other hospitals. Remaining on sick report, in quarters, 34.

Abstract of remarks by Maj. William E. Spencer, surgeon:

This regiment arrived at Camp Meade, Pa., from Camp Black on September 10, 1898, J. Wilson Fletcher, first lieutenant and assistant surgeon, having been left in charge of the hospital at Camp Black.

The prevailing diseases have been indigestion and malarial and typhoid fever, of which 48 of the most serious cases were sent to the Second Division Hospital. Two hundred and thirty cases occurred, of which 147 were treated in quarters and returned to duty; 1 man died in camp, and 34 cases were unfinished.

October.—(Camp Meade, Pa.) Mean strength averaged for thirty-one days: Officers, 25; enlisted men, 1,151; total, 1,276. Remaining from last month, 34; admitted from command, 141; total to account for, 175. Of 166 completed cases, 74 returned to duty and 92 were transferred to other hospitals. Remaining on sick report, in quarters, 9.

Abstract of remarks by Maj. William E. Spencer, surgeon:

The prevailing diseases have been intermittent fever and indigestion. In the latter part of the month slight cases of tonsillitis and bronchitis have appeared frequently on account of the cold weather. The number of patients on sick call had decreased very much in comparison with last month.

Nothing of note has occurred during this month.

November.—(Camp Meade, Pa., and Camp Wetherill, S. C.) Mean strength averaged for thirty days: Officers, 38; enlisted men, 940; total, 978. Remaining from last month, 9; admitted from command, 85; total to account for, 94. Of 84 completed cases, 62 returned to duty; 22 were transferred to other hospitals; remaining on sick report in quarters, 10.

Abstract of remarks by Maj. William E. Spencer, surgeon:

The prevailing disease for the month has been bronchitis, caused principally by lack of heat during inclement weather conditions, this command not being supplied with stoves until November 27.

This command left Camp Meade, Middletown, Pa., November 15, arriving at Camp Wetherill, S. C., November 17, 1898.

Nothing calling for comment or report has occurred during this month.

December.—(Camp Wetherill, Greenville, S. C.) Mean strength averaged for thirty-one days: Officers,

39; enlisted men, 1,071; total, 1,110. Remaining from last month, 9; admitted from command, 287; otherwise admitted, 1; total to account for, 297. Of 260 completed cases, 254 returned to duty; 6 were transferred to other hospitals. Remaining on sick report, in hospital, 5; in quarters, 32.

Abstract of remarks by Maj. William E. Spencer, surgeon:

During the month there has been a slight epidemic of influenza in this regiment.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE TWO HUNDRED AND FIRST NEW YORK VOLUNTEER INFANTRY.

Brief outline of the medical history.—In response to the second call, this regiment was mustered by companies in the armory of the Twelfth New York National Guard, in New York City, the companies being sent thence to Camp Black, near Hempstead, Long Island, the first companies reaching there about July 7, 1898, and the other following at intervals, the whole regiment having thus assembled at Camp Black by the 1st of August. While the Two hundred and first New York was at Camp Black the Two hundred and second and Two hundred and third New York Volunteer Infantry, a detachment of recruits for the Seventy-first New York Volunteer Infantry, and the Fourth, Fifth, and Seventh Batteries of Light Artillery—other New York military organizations responding to the second call—were also temporarily located at that camp. Moreover, it must be remembered that Camp Black had been previously occupied temporarily by some of the New York military organizations which had responded to the first call for volunteers. For example, the Third New York Volunteer Infantry (at Camp Black May 15 to 28), the Fourteenth New York Volunteer Infantry (left Camp Black May 18), the Sixty-fifth New York Volunteer Infantry (at Camp Black May 2 to 19), and the Sixty-ninth New York Volunteer Infantry (at Camp Black from the last of April to the 24th of May), as has been ascertained by the board, preceded the above-named second-call volunteer commands in the occupancy of Camp Black as a temporary point of mobilization. The camp of the Two hundred and first New York lay between that of the Two hundred and second on the west and that of the recruits of the Seventy-first on the east, the camp of the Two hundred and third being just beyond and east of the latter, while the camps of the artillery organizations were still farther to the east. (See general sketch map of Camp Black as in August.) We have not been able to learn definitely whether or not the camp site of the Two hundred and first New York had been previously occupied by one or more of the first-call organizations. It remained at Camp Black, it is believed, without shifting, until the 9th of Sep-

tember, when it started by rail for the national camp in Pennsylvania. The regiment reached Camp Meade, Pa., on the 10th of September, was assigned to the Second Brigade, Second Division, of the Second Army Corps, and went into camp with the Fifth Massachusetts—another member of the brigade direct from its State camp. (The Fourth Missouri and the Sixteenth Pennsylvania from Camp Alger, Va., were also members of this brigade. The Seventh Illinois and the Sixth Pennsylvania, likewise from Camp Alger, were temporarily attached under orders to be mustered out. See histories of these regiments, under Camp Alger.) The Two hundred and first New York remained in Camp Meade until November 15, when it started by rail for Camp Wetherill, near Greenville, S. C., where it arrived on the 17th. The regiment was still in Camp Wetherill on the 31st of December, 1898; it was mustered out of the service of the United States April 3, 1899, at Greenville, S. C.

The medical history as given by the board covers a period of six months and twenty-four days. Of this time, sixty-four days were spent in the State rendezvous, Camp Black, Long Island; sixty-six days in Camp Meade, the national camp in Pennsylvania, and forty-four days in the national camp near Greenville, S. C.

During the latter part of its stay in the State rendezvous at Camp Black the Two hundred and first New York began to suffer from typhoid fever, and when it moved to the national camp in Pennsylvania the infection was still continuing to spread. The rather sharp epidemic following this wide infection in the State camp increased after arrival at the national camp in Pennsylvania, but before the regiment left that camp for the South the infection of typhoid fever in it had been quite extinguished. In addition to the above extracts of testimony bearing upon the development of typhoid fever in the Two hundred and first New York, it may be pertinent to refer here to the histories of the Third, Fourteenth, and Sixty-fifth New York Regiments, which seem to indicate that these first-call regiments left Camp Black carrying with them the infection of typhoid fever to the national camps where they had gone.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained. For details of the method and system of examination, nomenclature, and classification pursued in these tabular statements we would refer to the introductory remarks at the commencement of the Second Corps as at Camp Meade, Pa.

[Two hundred and first New York Volunteer Infantry; mean strength, 1,076.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease		
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	Typhoid.	All other.
July.....	37	2	.....	39	8	.....	.....	.....	.....	.....	.....
August.....	91	6	.....	97	39	2	3	12	17	.....	.....
September.....	38	3	.....	41	122	16	37	73	126	10	.....
October.....	4	.....	.....	4	59	4	14	31	49	4	.....
November.....	4	.....	.....	4	11	.....	.....	3	3	2	.....
December.....	34	7	1	42	5	.....	.....	.....	3	3	2
Total.....	208	18	1	227	244	22	54	119	195	19	2

The above-tabulated deaths from disease, by months, were distributed among the companies as follows:

	Company.											Total.	
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.		M.
Typhoid.....	2	1	1	2	1	1	6	1	1	2	1		19
Other diseases.....			1	1									2
Total.....	2	1	2	3	1	1	6	1	1	2	1		21

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such other attacks.

Intestinal disorders in the Two hundred and first New York.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Single short diarrhea.....	12	7	8	7	9	9	7	15	15	8	14	15	126
Two attacks short diarrhea.....	.....	1	.....	.....	1	1	1	1	3	.....	1	.....	9
Short and long diarrhea.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Single long diarrhea.....	.....	.....	1	.....	.....	.....	.....	.....	2	2	1	.....	8
Total diarrhea.....	18	17	16	16	22	11	10	24	31	16	24	23	228

Totals include diarrhea in malaria and typhoid combinations.

Combinations of continued or malarial fever in the Two hundred and first New York.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Short malaria (uncombined).....	14	14	12	16	7	6	9	7	16	14	16	.....	147
Short malaria preceded by diarrhea.....	2	.....	3	4	3	.....	.....	1	3	4	.....	.....	20
Short malaria followed by diarrhea.....	2	1	1	1	1	.....	.....	1	.....	1	1	.....	10
Short malaria preceded and followed by diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1
Two attacks short malaria preceded by diarrhea.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	1	.....	4
Two attacks short malaria followed by diarrhea.....	.....	2	.....	.....	.....	.....	.....	1	.....	1	.....	.....	4
Two attacks short malaria.....	2	1	2	2	1	.....	1	.....	3	1	2	.....	15
Short and long malaria preceded by diarrhea.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	2
Long malaria (uncombined).....	.....	4	1	7	2	1	.....	.....	1	.....	3	.....	19
Total short malaria.....	18	21	23	30	18	8	10	11	24	27	26	25	244
Total long malaria.....	.....	4	2	7	3	1	.....	.....	1	1	3	.....	22

Totals include malaria in typhoid combinations.

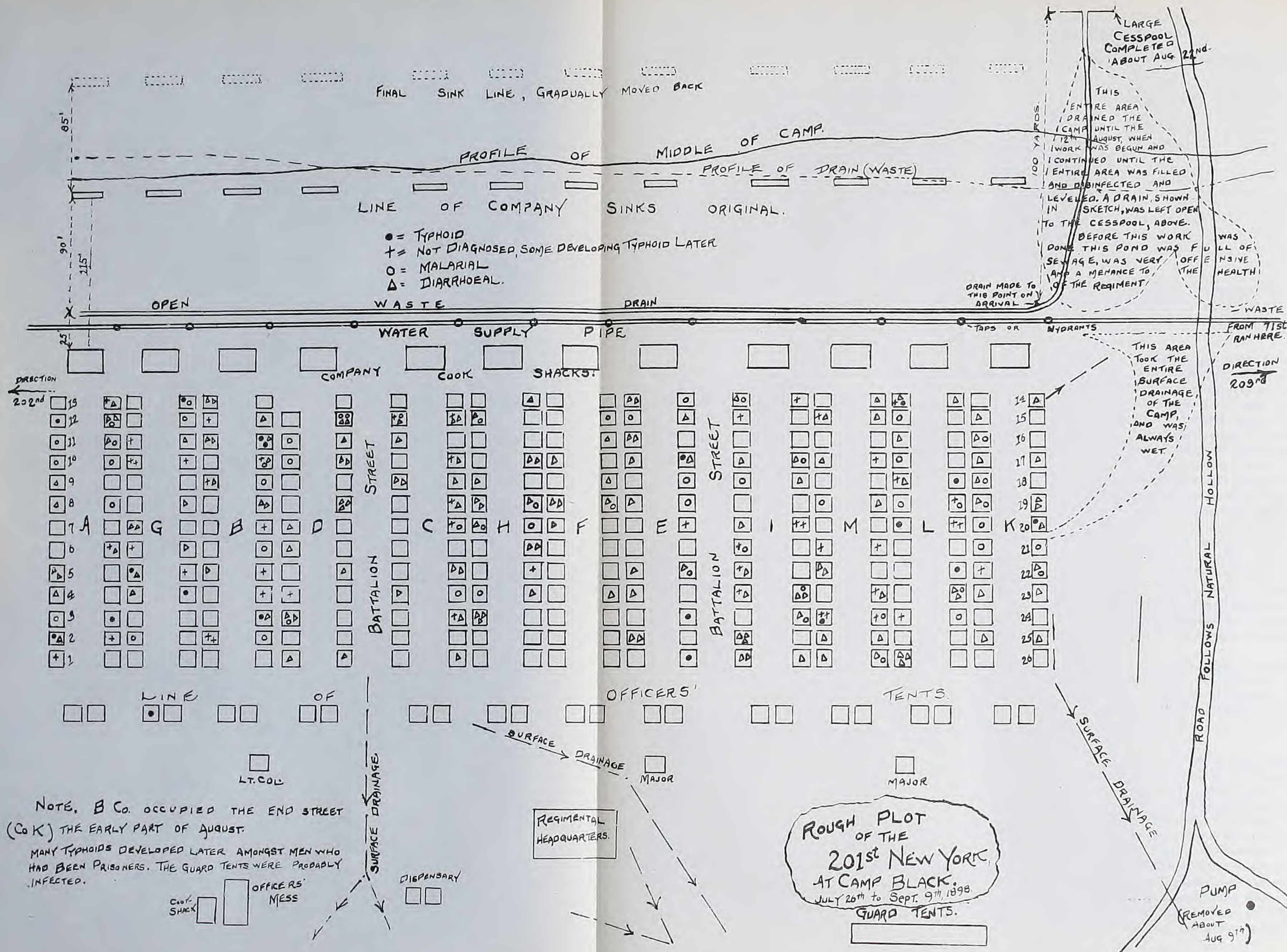
Combinations of typhoid fever in the Two hundred and first New York.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Certain typhoid (uncombined).....	9	8	7	12	7	4	14	2	4	4	8	5	84
Probable typhoid (uncombined).....	1	3	1	2	3	1	4	3	9	2	6	4	41
Typhoid beginning in diarrhea.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....	.....	2
Probable typhoid beginning in diarrhea.....	1	2	.....	3	3	.....	.....	.....	3	1	3	2	18
Typhoid preceded by diarrhea.....	1	.....	1	.....	1	.....	1	.....	1	1	1	.....	6
Probable typhoid followed by diarrhea.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Probable typhoid followed by diarrhea.....	1	.....	.....	.....	.....	.....	3	.....	.....	.....	1	.....	5
Typhoid preceded by malaria.....	1	1	5	.....	1	.....	1	.....	1	.....	2	1	12
Probable typhoid preceded by malaria.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Combinations of three diseases.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1
Total certain typhoid.....	11	12	8	20	11	4	15	2	8	7	13	8	119
Total probable typhoid.....	1	5	2	3	3	1	5	6	10	2	9	5	54
Total probable and certain typhoid.....	12	17	10	23	14	5	20	8	18	9	22	13	173

The records of sickness in this regiment are very incomplete and to some extent conflicting. By way of illustration: Although this regiment began to assemble at Camp Black July 7, its State camp on Long Island, the earliest monthly sick report found is that for September. Furthermore, there were 57 cases of so-called short malaria, etc., recorded of which the final disposition was not mentioned. How many of these were really typhoid fever and should have been added to the total number of probable typhoid-fever attacks in the above summary table it was of course impossible for us to determine. That there were at least some, possibly many, we think can not be reasonably questioned. Moreover, we have encountered 3 fatal cases of typhoid fever, of which the only sick record discoverable was the death return on file in the Adjutant-General's Office. The foregoing tabular statement of sickness should therefore, in our opinion, be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Two hundred and first New York Volunteer Infantry as a member of the Second Brigade and Second Division of the Second Army Corps, as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(*a*) The regiment was in the State camp, Camp Black, near Hempstead, Long Island, from July 7 to September 9; it was in the national camp, Camp Meade, Pa., from September 10 to November 15; it was in the national camp, Camp Wetherill, near Greenville, S. C., from November 17 to December 31, 1898; and it was mustered out at the latter place April 3, 1899. The initial date of the first probable attack of typhoid fever was August 20, of the first certain attack of typhoid fever August 4. During the latter part of the stay at Camp Black the regiment began to suffer from typhoid fever, and when it moved to the national camp in Pennsylvania the in-



fection still continued to spread. The medical history as given by the board covers a period of six months and twenty-four days (from July 7 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 227; of so-called malaria, etc., 244; of so-called long malaria, etc., 22; of probable typhoid fever, 54, and of certain typhoid fever, 119. Total attacks of probable typhoid fever (long malaria, etc., included), 195.

(c) Total deaths from typhoid fever, 19; total deaths from all diseases, 21; mortality per cent of total probable typhoid attacks, 9.74; of certain typhoid attacks, 15.96; per cent of typhoid deaths to all deaths by disease, 90.50.

(d) The mean strength was 1,076. The per cent of typhoid morbidity to mean strength: As to total probable typhoid attacks was 18.12, while the average for the brigade was 10.10; as to certain typhoid attacks was 11.05, while the average for the brigade was 6.89. The number of typhoid deaths per 1,000 of mean strength was 17.65, while the average for the brigade was 9.35 and for the division 8.78.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Two hundred and first New York:

Disease.	Individuals.	Average age.
Short intestinal disorders	48	23.0
Long intestinal disorders	5	24.2
Total intestinal disorders	53	23.1
Short malaria, etc.	119	25.1
Long malaria, etc.	10	24.6
Probable and certain typhoid attacks.....	105	24.3
Total probable and certain typhoid and long malaria.....	115	24.2
Grand total of all above classes.....	287	24.4
Five soldiers who died of typhoid fever		29.2

For comparison of these average age figures with similar data relative to other regiments in this brigade and division we refer to the general tables treating of this subject at the end of the Second Army Corps at Camp Meade, Pa. (See also similar tables relating to the regiments of the Second Division of the Seventh Army Corps at Jacksonville, Fla.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) The dissimilarities in the course of company epidemics in the Two hundred and first New York would appear to be, on their face, incompatible with the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means of propagation of these epidemics. Reference to the graphic chart and the foregoing tabular statement gives ample evidence of this truth, and it is unnecessary

to illustrate it further by entering into details here. It appears that the arrangement of companies in the State camp of the regiment at Camp Black, near Hempstead, Long Island, was from east to west, as follows: K, L, M, I; E, F, H, C; D, B, G, A.

(b) The company epidemics have frequent greater or less exacerbations in their course, and the intervals between these exacerbations are, as a rule, closely coincident with the average period of incubation of typhoid fever. An examination from this standpoint of the foregoing tabular statement or of the graphic chart will more or less definitely substantiate this declaration.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED BY THE GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN TENTS, VIEWED FROM THE STANDPOINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) We have endeavored to ascertain the names of soldiers as they were grouped in their tents, especially during the encampment of this regiment at Camp Black, Long Island, in order to examine into this important question as closely as possible. To this end we requested the necessary data from two different sources, namely, from the regimental surgeon and from the commanding officers of companies. The regimental surgeon, in response to this request, furnished a diagram map of the camp of the Two hundred and first New York as at Camp Black, with the various topographical features illustrated, as well as the grouping of sick soldiers in their respective company tents. The diagram accompanying this text is essentially a reproduction of that furnished by the regimental surgeon. It is well worthy of an examination in connection with the foregoing testimony of the regimental surgeon as to the course of sickness in this regiment, but we refer to it at this point for the special purpose of calling attention to the peculiar manner in which not only the apparently more serious but as well the apparently lighter attacks of disease among the soldiers in this camp seem to have been limited more or less to the occupants of certain tents. These attacks of diarrheal disturbances and of short fevers, or malarias, appear to fall under the same law of grouping as do the certain or suspected attacks of typhoid fever. The squad groups of the sick as plotted in their respective tents would appear to be incompatible with the assumption that the chief factor in the propagation of typhoid fever throughout the companies of this regiment may have been some agency whose influence was common and pretty constantly and simultaneously acting upon the whole command. On the contrary, they would appear to suggest a mode of disseminating infection which more effectively reached and acted upon certain limited groups of men while it passed by others, which would be entirely compatible with the assumption of a tent, squad, or comrade infection.

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation of this disease, and we have found a striking coincidence in the general averages of the figures thus obtained.

(a) We have obtained from this regiment data requisite for such a calculation from only one source—namely, as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the attack of typhoid fever. The Two hundred and first New York furnished four examples of diarrhea preceding typhoid fever by intervals which could fairly be regarded as measuring periods of incubation of typhoid fever. These four intervals averaged ten days length.

FIRST DELAWARE VOLUNTEER INFANTRY.

Third Brigade, Second Division, Second Army Corps, Camp Meade, Pa.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Lieut. C. R. Jakes, assistant surgeon in charge.]

Middletown, Del.—The muster of the regiment began on the 7th of May, 1898, and the last company was mustered in on the 19th of May. The regiment assembled and went into camp at Middletown on the 26th of April and remained there until the 20th of August. The water supply in the State encampment was that of the town of Middletown. It was distributed from a standpipe in Middletown, about a quarter of a mile away from the camp.

Fecal matter at that camp was disposed of by the pit system, the matter being covered three times a day, generally with earth and dry lime. The kitchen garbage was hauled away. The camp site was a good one, the camp ground not having been occupied by a military command since the war of the rebellion.

The regiment had considerable diarrhea while at that camp and 2 cases of dysentery. There were also 7 cases of measles. There were no fevers to amount to anything. Lieutenant Jakes did not think there was a case of fever lasting two weeks while the regiment was encamped there. When the regiment left for Camp Meade, Pa., one man, who had brain trouble, was left behind.

Camp Meade, Pa.—The regiment arrived at Camp Meade August 20. At the time this testimony was taken (about October 5, 1898) the first two battalions of this regiment had already left Camp Meade several days previous, having been ordered to Wilmington, Del., to prepare for muster out. Lieutenant Jakes, who had been left behind at Camp Meade as surgeon in charge of the Third Battalion, then remaining there, stated: "We have 15 cases in hospital this morning. Our last report was 28 men sick in the Second Division Hospital.

These were largely fever cases. The men would go from here to the Second Division Hospital, and there they would be given furloughs. This furloughing became so prevalent that I termed it 'furloughitis.' They got a little sick and then went over there and got thirty days' furlough." None of these furlough cases, as far as Lieutenant Jakes knew, had died.

Lieutenant Jakes could not remember how soon these fever cases began going to hospital after arriving at Camp Meade, Pa., but thought it did not begin until the boys went out on provost duty. The Second Battalion of the regiment went out on such duty. Out of the 15 cases above mentioned one of the companies of that battalion had 12 in hospital, or at least away from the command. That was Company B. It was transferred from that battalion to ours (the Third) when the other two battalions left for home. This company returned from provost duty on September 20, having been out on that service in the city of Harrisburg for twenty days. At different times Companies B, D, G, and I have been out on provost duty, two at Harrisburg, one at High Spire, and one scattered around. The two companies at Harrisburg were camped during this service upon different sites. Company B was the affected one. The other companies of the battalion remaining here have been comparatively healthy. G has had 3 cases of fever and I 3 cases. The companies remaining here in camp at Meade have had no serious fever whatever. They may have had a man sick for three or four days, but there have been no cases of serious character. The 12 cases above mentioned as sent by Company B to hospital occurred while that company was camped at Harrisburg. The men of this company began to develop fever cases within four or five days after going into camp at Harrisburg. "And it is my impression that if they had not gone out on provost duty there they would not have had the sickness they did." Company B changed their mode of living as soon as they went into camp at Harrisburg. The ladies of that place gave them refreshments about twice a week in their camp. Describing the site of the camp in Harrisburg, Lieutenant Jakes said: "There was a little stream covered with green scum when they went there, and I told the captain: 'You will have to get out of here unless the man who owns this ground will ditch and drain it.' I found the next day that it was ditched and drained and that the place looked very well. I think while there the command used water from old-fashioned pumps." Lieutenant Jakes thought that any milk consumed by that company would necessarily be inspected under the authority of the State inspector. As has been stated, there was as much sickness among this company as among all the other companies put together.

Companies A and M have not been out on provost duty. At the present time A has one man sick in hospital, sent there this morning with a hernia. Company

M has had 2 cases of fever. We did not keep them long enough to find out what was the matter.

The regiment has lost two men, one from "acute bronchitis," the other from embolism of the brain. "We went into camp at Middletown on the 26th of April and this man (the latter) died the 21st of May." Company B, which has suffered more than the others, has not lost a man.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE FIRST DELAWARE VOLUNTEER INFANTRY.

Camp Meade, Pa.—Capt. H. B. Carter, commanding Company A, furnished a list of his men grouped in tents in the last permanent camp at Camp Meade, and stated substantially as follows: The companies were arranged in battalions as follows: First Battalion, C, A, F, and K; Second Battalion, D, I, B, and E; Third Battalion, H, M, L, and G.

My company was never on detached service.

My company was entirely from an urban population, and the average intelligence of the men high. The average were reasonably prudent as to personal habits affecting health, and the financial status of the majority was above the average.

My company was exceedingly fortunate in this respect, there being but four or five cases of fever during our encampment. This was due principally, I believe, to the great care the men took of themselves.

Capt. A. F. Matlack, commanding Company C, furnished a list of his men grouped in tents, and stated substantially as follows: The companies were grouped in battalions as follows: First Battalion, C, A, K, and F; Second Battalion, D, I, G, and B; Third Battalion, E, L, M, and H.

This company was not on any detached service.

My company was chiefly from an urban population, and was of medium intelligence. They were reasonably prudent as to personal conduct and habits affecting their health. Their financial status was below the average.

My company did not suffer more from typhoid fever than did any other company in the battalion, as only one man had the fever, and he recovered.

Capt. George W. Sasse, commanding Company D, stated substantially as follows: The companies in my battalion were arranged as follows: D, I, G, and B, at Camp Tunnell, Middletown, Del., and the same formation existed at Camp Meade, Pa.

We were on detached duty only while at Camp Meade, as a provost guard at Harrisburg, Pa., for one month—about September 6 to October 6—our camp being in an orchard at the corner of Sycamore and Cameron streets.

Our company was about evenly divided between a rural and an urban population. The average intelligence of the men was medium. The men were prudent

as to personal conduct and habits affecting their health. Their financial status was about the average.

There was not a single case of typhoid fever in my company. We had several cases of what I believe was "malarial fever;" also quite a number who had diarrhea while at Camp Meade. This I attributed to the limestone water for which that locality was noted. But I believe all these troubles would have vanished after we got used to the water. My company had practically no sickness while at Camp Tunnell, Del.

Capt. John M. Curtis, commanding Company E, stated substantially as follows:

This company was not on any detached service.

The men of this company were chiefly from an urban population. Their intelligence was medium. They were reasonably prudent, and their financial status was about the average.

The companies of the First and Third Battalions suffered least, not being on any detached service, and being, therefore, more constantly under supervision of both regimental and company officers. In Camp Tunnell no case of illness occurred, where we were encamped from April 28 to August 20. This good health, I think, is due to a good supply of artesian water, a distant location of sinks, constant and watchful supervision by the colonel and experienced officers, and by the good drainage of the ground. Captain Curtis furnishes a rough sketch of Camp Tunnell, in which it is shown that the sinks are at the flanks of the regiment and not at the rear of the kitchens.

My company was almost exempt from typhoid fever. We had but 1 case, a private in the hospital service, who was believed to have contracted the disease in the division hospital, where he served on the arrival of the regiment at Camp Meade.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORT.

May.—(Camp Tunnell, Middletown, Del.) Mean strength averaged for thirty days: Officers, 47; enlisted men, 965; total 1,012. Admitted from command, 18; total to account for, 18. Of 15 completed cases, 13 returned to duty; 1 died; 1 otherwise disposed of. Remaining on sick report, 3.

Abstract of remarks by James L. France, major and surgeon:

The sanitary condition of Camp Tunnell is very good, and general health is first class. One man had concussion of brain, resulting from being thrown to the ground in athletic sports—wrestling. Another sustained a fracture from the same cause.

June.—(Camp Tunnell, Middletown, Del.) Mean strength averaged for thirty days: Officers, 47; enlisted men, 958; total, 1,005. Remaining on sick list from last month, 3; admitted from command, 28; total to account for, 33. Of 24 completed cases, 24 returned to

duty. Remaining on sick report—in hospital, 5; in quarters, 4.

Abstract of remarks by James L. France, major and surgeon:

Sanitary condition of Camp Tunnell is good, and general health first class. Three men were injured while participating in athletic sports, and one while jumping from a train which did not stop at station. Was returning from leave of absence.

July.—(Camp Tunnell, Middletown, Del.) Mean strength averaged for thirty days: Officers, 47; enlisted men, 944; total, 991. Remaining on sick list from last month, 9; admitted from command, 46; total to account for, 55. Of 47 completed cases, all returned to duty. Remaining on sick report, 13.

Abstract of remarks by James L. France, major and surgeon:

Sanitary condition of camp is very good, and general health first class. Two injured; one received in skirmish drill, from which there was complete recovery, and one caused by jumping from train which did not stop at the station.

August.—(Camp Tunnell, Middletown, Del., and Camp Meade, Middletown, Pa.) Mean strength averaged for thirty days: Officers, 28; enlisted men, 934; total, 962. Remaining on sick report from last month, 7; admitted from command, 42; total to account for, 49. Of 41 completed cases, all returned to duty. Remaining on sick report—in hospital, 2; in quarters, 5.

Abstract of remarks by James L. France, major and surgeon:

The general health of the command is excellent. Case 85 was discharged on account of disability.

September.—(Camp Meade, Middletown, Pa.) Mean strength averaged for 30 days: Officers, 47; enlisted men, 899; total, 946. Remaining on sick report from last month, 6; admitted from command, 113; total to account for, 119. Of 115 completed cases, 64 returned to duty; 1 died; 46 were transferred to other hospitals; 2 were discharged for disability; 2 were otherwise disposed of. Remaining on sick report in hospital, 4.

Abstract of remarks by James L. France, major and surgeon:

Sanitary condition of the camp of this command is very good and general health fair. In one case fracture was caused while horseback riding, the horse falling down an embankment and throwing the rider very violently to the ground. In another case patient contracted severe cold while performing guard duty. Was sent to hospital at Lancaster, and while there died of acute bronchitis, which information came in an indirect way.

October.—(Camp Meade, Middletown, Pa.) Mean strength average for thirty days: Officers, 14; enlisted men, 308; total, 322 (First Battalion). Remaining on sick report from last month, 1; admitted from command, 9; total to account for, 10. Of 9 completed cases, 2 returned to duty; 7 were otherwise disposed of. Remaining on sick report, 1.

Abstract of remarks by Charles R. Jakes, first lieutenant and assistant surgeon:

Eight companies of the regiment were ordered home on October 4, to be mustered out of service, Maj. James L. France and Asst. Surg. James R. McCausland accompanying the two battalions.

October.—(Armory at Wilmington, Del.) Two battalions, First and Second. Mean strength averaged for thirty days: Officers, 18; enlisted men, 69; total, 87. Remaining on sick report from last month, 1; admitted from command, 7; total to account for, 8. Of 4 completed cases, 2 returned to duty and 2 died. Remaining on sick report—in hospital, 2; in quarters, 2.

Abstract of remarks by James L. France, major and surgeon:

Only 87 officers and men on duty; the balance of the two battalions are on thirty days' furlough preparatory to mustering out.

November.—(Wilmington, Del.) Third Battalion only. Mean strength average for 6 days: Officers, 14, enlisted men, 282; total, 296. Remaining on sick report from last month, 1; admitted from command, 7; total to account for, 8. Of 4 completed cases, 2 returned to duty; 1 died; one was otherwise disposed of.

November.—(Armory Wilmington, Del.) Two battalions of regiment. Mean strength averaged for 16 days: Officers, 30; enlisted men, 546; total, 576. Remaining on sick report from last month, 4; total to account for, 4. Of four completed cases, 1 returned to duty and 3 were otherwise disposed of.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FIRST DELAWARE VOLUNTEER INFANTRY.

Brief outline of medical history.—This regiment assembled at Camp Tunnell, the State camp, near Middletown, Del., on the 26th of April, 1898, where it remained encamped until the 20th of August, on which latter date it went by rail to the national camp near Middletown, Pa., arriving there the same day. On the 20th of August the regiment reached the national camp, Camp Meade, near Middletown, Pa., was assigned to the Third Brigade, Second Division of the Second Army Corps, as at Camp Meade, and went into camp with the other regiments of this brigade, viz, the Third Missouri and the First Rhode Island, which two had previously been at Camp Alger, Va. (See their histories, under Camp Alger.) On the 4th of October the First and Second Battalions of the First Delaware moved to Wilmington, Del., preparatory to muster out, leaving the Third Battalion behind at Camp Meade until the 6th of November, when it also returned to Wilmington, Del., preparatory to being mustered out.

The medical history covers a period of six months and twenty-one days. Of this time one hundred and eighteen days were spent in the State camp. The First and Second Battalions were at Camp Meade, the national

camp, for forty-five days; the Third Battalion was in the same camp for eighty-eight days.

It is very clear that the First Delaware had some scattering cases of typhoid fever while in its State camp, and equally certain that it carried with it to the national camp the infection of this disease.

It is probable, nevertheless, that nearly all of the typhoid fever experienced by this regiment after it joined the Second Corps at Camp Meade, Pa., was acquired not in the national camp, but at Harrisburg, Pa., while detachments of the regiment were stationed in that city on provost-guard duty.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (typhoid included) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained.

[First Delaware Volunteer Infantry; mean strength, 926.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from diseases.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	All other.
May.....					1		1		1	1
June.....	6	2	2	10	6	1			1	
July.....	14	1	2	17	7	1	1	1	3	
August.....	12	2	14	28	7	1	2	1	4	
September.....	9	1	10	20	3	7	10	18	35	1
October.....					7	2	1	8	11	3
November.....					2		2	2	4	2
December.....										
Total.....	41	6	2	49	68	12	17	30	59	6

A rectification of the total number of so-called long malaria, etc., as given in the above summary table should be made by reducing the total of 12 to 11, thus requiring a corresponding reduction of the number of total probable typhoid attacks from 59 to 58.

The above tabulated deaths, by months, were distributed among the companies of the regiment as follows:

	Company.					Staff.	Total.
	A.	F.	G.	H.	I.		
Typhoid.....	1	1	1	1	1	1	6
Other diseases.....					1		1
Total.....	1	1	1	1	2	1	7

The following is a series of three tables showing by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) those who have had such other attacks.

Intestinal disorders in the First Delaware.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea.....	3	2	3	2	2	1	4	1	3	3	5	1		30
Two attacks short diarrhea.....									1	2				3
Single long diarrhea.....			1		2		1			1				5
Prolonged diarrhea.....			1					1						2
Total diarrhea.....	3	2	4	2	4	1	5	2	4	4	5	1		49

Totals include diarrhea in malarial and typhoid combinations.

Combinations of continued or malarial fever in the First Delaware.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	4	10	6	3	1	3	1	8	3	5	5	4		53
Short malaria preceded by diarrhea.....		4			1		1							6
Short malaria followed by diarrhea.....					1									1
Two attacks of short malaria.....				1								1		2
Long malaria (uncombined).....	2	1			1		3	1			1	1		10
Total short malaria.....	5	14	6	3	3	3	4	9	3	5	5	5		68
Total long malaria.....	3	1					3	1			1	1		12

Totals include malaria in typhoid combinations.

Combinations of typhoid fever in the First Delaware.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	7	8		2		1			5		2		2	27
Probable typhoid (uncombined).....		1					2	1	3			2	1	10
Typhoid beginning in diarrhea.....	1									1				2
Probable typhoid beginning in diarrhea.....		1				1				1				3
Probable typhoid preceded by diarrhea.....						1								1
Typhoid preceded by malaria.....	1													1
Probable typhoid preceded by malaria.....				1					1					2
Probable typhoid followed by malaria.....							1							1
Total certain typhoid.....	9	8		2		1			5		3		2	30
Total probable typhoid.....	1	1	1			5	1	4		1	2		1	17
Total probable and certain typhoid.....	9	9	1	2		6	1	9	5	4	5		3	47

The records of sickness in this regiment were found to be more or less incomplete, and to some extent conflicting. By way of illustration: A case of so-called malaria was entered in the regimental reports as having been sent to division hospital of which no trace could be found in the hospital returns. Moreover, there were 16 cases of so-called short malaria, etc., among the medical records relating to the First Delaware whose final disposition was not mentioned. Furthermore, of the 6 deaths by typhoid fever in this regiment 4 were not mentioned in the regimental medical records. The above tabular statement of sickness should be regarded as a fair estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the First Delaware Volunteer Infantry as a member of the Second Division,

Second Army Corps as at Camp Meade, Pa., may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Middletown, Del., from April 26 to August 20; it was in the national camp, Camp Meade, near Middletown, Pa., from August 20 to October 3 and November 6; it was at Wilmington, Del., for muster out from October 3 and November 6, respectively, to November 16, 1898, when the regiment was mustered out. The initial date of the first case suspicious of typhoid fever was May 21, of the first case classed by the board as certain typhoid fever was July 27. On the 17th of June a case of so-called "malarial intermittent" was admitted to sick report and was returned to duty at the end of ten days (see subsequent remarks on this case); on the 27th of July there was a so-called case of "diarrhea," which was discharged August 25; on the 2d of August a case of "intermittent malaria" was admitted to sick report for ten days; on the 19th of August a case was admitted to the sick report which developed into typhoid fever; on the 22d of August (two days after reaching Camp Meade) 2 probable cases of typhoid fever developed. Hence it seems that the regiment experienced a few scattered attacks of typhoid fever before reaching the national camp in Pennsylvania, which were followed by a few cases soon after the regiment reached that camp. The First Delaware must therefore be classed among those organizations which carried the infection of typhoid fever with them to the national camp. The medical history of the regiment covers a period of six months and twenty-one days (from April 26 to November 16, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorder, 49; of so-called short malaria, etc., 68; of so-called long malaria, etc., 11; of probable typhoid fever, 17, and of certain typhoid fever, 30. Total attacks of probable typhoid fever (long malaria, etc., included), 58.

(c) Total deaths from typhoid fever, 6; total deaths from all diseases, 7; mortality per cent of total probable typhoid attacks was 10.34; of total certain typhoid attacks was 20; per cent of typhoid deaths to all deaths by disease was 85.71. •

(d) The mean strength was 926. The per cent of typhoid morbidity to mean strength: As to total probable typhoid attacks was 6.27, while the average for the division was 15.69; as to total certain attacks was 3.23, while the average for the division was 10.14. The number of typhoid deaths per 1,000 of mean strength was 6.46, while the average for the division was 8.78.

SECOND PENNSYLVANIA VOLUNTEER INFANTRY, UNATTACHED.

COMMUNICATION CONCERNING SANITARY PRECAUTIONS
IN THE SECOND PENNSYLVANIA VOLUNTEER INFANTRY,
BY FRANCIS R. PACKARD, FIRST LIEUTENANT
AND ASSISTANT SURGEON.

Montchanin, Del., and Pengrove, N. J.—The regiment responded under the first call for volunteers and was mobilized at Mount Gretna, Pa., in April, arriving at the camp in a cold snow and rain storm. It remained at Mount Gretna until the 18th of May, when one battalion was sent to Pompton Lakes, N. J., under command of Lieutenant-Colonel Dechert, to guard the Laflin-Rand Powder Works, at that place. A few days after its arrival, however, the command was ordered to Pengrove, N. J., to guard the Du Pont Powder Works, at Carneys Point, and throughout the summer stayed at that station, being united with the other battalion at Montchanin, Del., on the 6th of September.

The battalion which was left at Mount Gretna was sent on the 19th of May to Montchanin, Del., to guard the Du Pont Powder Works, located there, and it remained on that duty until September 15, when the entire command returned to Philadelphia under orders to be mustered out. Colonel Porter stayed with this battalion.

The surgeon of the regiment was Dr. Herman Burgin. There were two assistant surgeons with the rank of first lieutenant—Dr. Robert P. Robins, who was stationed at Pengrove, and the writer, who was at Montchanin. Doctor Burgin remained at the latter place. While at Mount Gretna the regiment had a strength of 75 men to a company, but by the middle of June it had been recruited to 10 companies of 106 men each.

Before proceeding further I would premise by stating that throughout the regiment's entire stay in camp there was but one death, that of a sergeant, who did not come to the hospital at Pengrove until two days before his death, and who was then delirious and in a practically moribund condition with typhoid fever. He had been absent in Philadelphia for some time previous to his illness. There was no other case of typhoid fever in the regiment, nor was there any other case of really serious illness of any kind. The absence of typhoid fever in the battalion at Montchanin, Del., is rendered more remarkable by the fact that in the little village of Rising Sun, about 1 mile from the camp at Montchanin, there was an epidemic of typhoid fever in which there occurred 18 cases and 2 deaths in a period

of about four weeks. It was to this village that the men were in the habit of resorting for their amusement when off duty, as it contained the nearest saloons and was the most considerable settlement in the immediate neighborhood. With reference to the epidemic of typhoid fever in the village of Rising Sun, Lieutenant Packard said: This village had 450 to 500 inhabitants, and is located on either side of the Brandywine about a mile and a half from the camp. The water supply of this village was furnished by private wells, some of them located lower on the sloping ground than the outdoor privies. In two instances Lieutenant Packard observed drippings from the privies above through the soil to the wall of the wells below. The rector in the village stated that epidemics of typhoid fever were not uncommon in this village. Such wells were the only water supply of the village. As to the reasons for such an excellent health record for this regiment I would submit the following:

In the first place, the number of men encamped at one place after our departure from Mount Gretna at no time exceeded 530, exclusive of officers, until September 6, when the two battalions were joined at Montchanin and remained together until the return to Philadelphia of the entire regiment on September 15.

Second, the location of the camp at Montchanin was on sloping ground on a hill, in a place free from trees and covered with sod, having a shaly soil beneath, which became sandy at a depth of a few feet. The location of the site of this camp (of the First Battalion) was along the line of the Wilmington Northern Railroad, between it and the Brandywine River, along either side of which for 2 or 3 miles were stretched the works of the Dupont Powder Mill Company, which this battalion was ordered to guard. From the line of railway the ground rapidly ascended to a ridge of considerable elevation, running parallel with the railway track, upon which ridge was located the line of headquarter tents, facing northward. The camp of the battalion was immediately to the north of headquarters, the ground sloping slightly toward the Brandywine, about a mile distant to the north. The surface drainage of this camp was rapid and very perfect: from the line of headquarter tents in the rear down to the railway track not far distant the slope was sharp to the southward. From this line of tents to the north the slope was gradually downward to the distant Brandywine. From the west flank of the camp there was a more or less rapid west-southwesterly slope. On this latter slope, about in a line with the headquarter tents, but at a considerable distance, were located the officers' sink and the guard tent. There were two latrines for the use of the men of the battalion located about 350

feet to the north of and somewhat below the line of cook shacks, on the rear or northern flank of the battalion camp. Between the cook shacks and the lines of the corresponding company tents was located for each company a mess space covered only with a fly, not otherwise inclosed. As the sinks would be filled up and abandoned other sinks would be dug in turn at a greater distance, each time farther removed from the cook sheds. In a line with the battalion latrines, and somewhat to the westward, on considerably lower ground than the site of the battalion camp, a bonfire was kept constantly burning for the incineration of solid parts of the kitchen garbage and all other police materials, and near this bonfire was located an open sink for the reception of the fluid parts of the waste, which daily was covered with dry lime and earth by the stewards in charge of the latrines. When these waste sinks would be filled and abandoned the bonfire above mentioned would be set going upon the site, this aiding in the removal of any danger from this quarter. It should be mentioned that when the Second Battalion from Penn Grove joined the regiment at Montchanin on the 6th of September, it was located on ground to the westward of and adjoining the camp of the First Battalion, the latter battalion having been shifted slightly to the east in order to make more room for the Second Battalion. When the Second Battalion arrived the bonfires above mentioned were displaced farther westward, about in a line with the western flank of the Second Battalion. It should be stated here that at no time were the men troubled at all with mosquitoes, and the presence of house flies at the sinks and kitchens was not at all uncommon or troublesome as to numbers.

It should be mentioned, in discussing the site of the camp at Montchanin, that previous to the arrival of the Second Battalion here in May the powder works had been guarded by a portion of Battery M of the Fourth Artillery. The camp of this battery had been located upon the sharp slope of the hillside between the railway station and the line of headquarter tents above mentioned of the Second Battalion, the latrines of this battery being placed considerably to the westward of their camp and near the location of the officers' sinks of the First Battalion, as above described—that is to say, on ground sloping rather sharply westerly from the battery camp and the railroad station.

As to the water supply of the camp at Montchanin, it is to be noted that for the most of the period the sole supply was obtained from the railroad well along the line of the railway, somewhat to the east of the location of the railway station and on the southern side of the track—that is to say, on the side opposite from the line of the battalion camp. It is also to be remarked in

this connection that the whole surface drainage of the camp and of the railway station itself was in a direction away from and to the westward of this well. Until about the 4th of July there was plenty of water in this well for the supply of the camp. During this period the water, in beer kegs, was hauled by prisoners, upon ordinary baggage trucks belonging to the railway station, up the steep acclivity of the hillside to the site of the First Battalion camp. There was no means provided for the storage of large quantities of water in the camp, the water being kept from day to day in water boilers and pails near the company kitchens. This water supply becoming low in the dry season—about the 4th of July—resort was had to water from a private reservoir of the Dupont Powder Company, located to the northeast and below the level of the site of the battalion camp and a considerable distance from the latter. A supply was piped from this reservoir to the lower part of the camp ground in the neighborhood of the reservoir and hauled from this point to the company kitchens in the manner described above. The quality of the water having been shown to be wholesome by several tests made at different times, it was not deemed necessary to take any precautions by boiling it.

The camp of the Second Battalion while at Penn Grove, N. J., was on the edge of a village in a grove of trees upon the sand of the river embankment, which was pretty flat, with a slight grade toward the river. The sandy nature of the soil prevented the dampness which might have resulted from the trees. The site of this camp occupied the ground between the village street running parallel to the river and a stone embankment at the river's edge. At flood tide the water of the river rose against this stone embankment, and at low ebb tide there was considerable sandy beach exposed at the foot of the stone wall. This stone wall faced to the westward. The line of company officers' tents was located parallel and near to the above-mentioned village street. The lines of company tents stretched from the officers' quarters toward the river embankment, the company kitchens at the rear end being some 30 feet distant from the latter. On the northern flank of the battalion camp ran a cross street from the main village street above mentioned down to the river bank. On the south side of this cross street, within the grounds of the battalion camp, was located a battalion hospital. On the northern side of this cross street was located a line of headquarter tents, with the guard tent in the same line near the river and the officers' sink at the same distance to the north. At the river end of the above-mentioned cross street there was a sort of projection or pier extending a little distance into the water, from which at high tide the men often plunged during their bathing. The latrine for the use of the enlisted men was located over the remains of a wrecked scow a little distance out from the stone embankment, opposite the southeast corner of the camp. A narrow wooden

gangway connected this latrine with the embankment. As mentioned elsewhere, even at low tide there was a foot or so of water constantly in the wreck of this scow. It should be mentioned that the wreck was in no way inclosed below the level of the floor of the latrine, for there remained only the ribs of the sunken vessel, so that the ebb and the flow of the tide found little obstruction. (The board note in this connection that while during ebb tide the disposal of fecal matter was probably very satisfactory, at the time of flood there was a possibility of the carrying of this matter with the flow of the current up along the stone embankment opposite the camp site, and even beyond the pier above mentioned from which the soldiers were in the habit of plunging into the river.)

During the first part of the encampment of the Second Battalion at Penn Grove the water supply was obtained from two private wells upon the grounds of neighboring cottages near the southeast corner of the encampment, the water supply of the village being of a similar character. In the dry season, this water supply running low, a well with a cucumber pump was sunk in one of the company streets not very far from the stone embankment (a distance not definitely fixed). This was a shallow well, striking water at a depth of 15 or 20 feet. This water was undoubtedly obtained by the water of the adjacent river percolating through the soil, for it tasted, especially in flood tide, decidedly brackish. It should be noted in this connection, however, that several analyses of the water of this battalion were made, proving the water in each instance to be potable.

During the dry season in the camp at Penn Grove, in consequence of the main street above mentioned being a dirt road, there was some trouble with dust along the line of company officers' tents and for some little distance into the camp. It should also be noted that during July green-head flies were exceedingly troublesome, but that at no time was there more than ordinary annoyance from swarms of common house flies, either at the sinks or at the company kitchens. It must be stated, however, that at this camp mosquitoes were excessively annoying.

Bathing facilities were excellent for both camps—the Brandywine near the Montchanin encampment, the Delaware River at Penn Grove—and the men availed themselves of their privileges in this direction to the fullest extent. At Montchanin the men were allowed to bathe only at one place on the Brandywine—within an inclosure made for the purpose at a point about a quarter of a mile upstream from the powder works, in a southwesterly direction from the site of the camp. It should be remarked that there were no villages located along this stream upward from this bathing place for some miles, neither was there any objectionable drainage entering into the stream for a similar distance. (The board would recall attention in con-

nection with bathing at Penngrove to its remark made in connection with the flow of the tides from the latrines of that camp.)

The food furnished the men was the regular Government ration. It was of excellent quality and ample in amount. It was regularly subjected to a rigid inspection whenever an issue of fresh beef, vegetables, etc., was made. The commissary exchanged the flour issued by the Government for bread baked at one of the best bakeries in Wilmington. The bacon in the latter part of the summer partook somewhat of the nature of "sow belly," but at no time was uneatable. The men made a great deal of what we are told was a frequent cause of complaint throughout the civil war that the coffee issued them was adulterated with saltpeter by the Government for the purpose of allaying their animal spirits, so as to render the task of keeping them within bounds less difficult. Of course, this was farcical. I do not think it ever occurred to the mind of anyone save an enlisted man to attribute such properties to saltpeter, and I am sure there was no adulteration of the coffee in our camp with it.

The sanitary arrangements of both camps were practically perfect. The sinks at Montchanin were built after an original design by Major Burgin, as follows: A hole was dug 20 feet long, 8 feet deep, and 2 feet wide. The carpenter in the regiment constructed a framework of 3 by 4 timbers, which was supported by uprights. This framework was 4 feet longer and 2 feet wider than the pit. It was covered by a broad piece of muslin which came to within 6 inches from the top and within 6 inches from the ground. A roof of the same material was also placed over the frame. The muslin, after being tacked to the framework, was whitewashed. By means of this simple contrivance decency and shelter from the elements were provided for, and the framework was so light and durable that as soon as one hole became filled it could be easily lifted over another one, and would with care last an indefinite time. Every morning it was the duty of one of the Hospital Corps to sprinkle carbolic-acid solution over the 3 by 4 timbers which served as a seat, and wherever else there might have been soiling of the frame by excreta. He also scattered dry earth and lime over the excreta in the pit. No sink was ever placed within 300 feet of the kitchens or the men's tents.

At Penngrove the men's sink was located on the wreck of an old scow, which lay some distance off the bank. A framework similar to the one in use at Montchanin was constructed on the timbers of the old wreck, and the men defecated into the old hulk, whence the excreta would be flushed out with every tide. The scow was reached by means of a plank walk. By this ingenious device Doctor Robins effectually overcame the difficulty he had to contend with of making sinks in a sandy soil. The officers' sink he located in a place where the

soil was not so sandy as it was within the camp, some distance back from headquarters street.

The policing of the camps was most vigilantly looked after, the commanding officers, Colonel Porter and Lieutenant-Colonel Dechert, continually impressing upon the company officers the necessity for absolute cleanliness. No waste paper or other trash was allowed to remain about the camp, it being removed to a waste pile, which was at a distance from the tents and on which a fire was kept constantly going. At least once a week, when practicable, a warm, sunny day was chosen and every tent was struck, the floors taken up, and the surface soil which had lain beneath the tent turned up with the spade and exposed to the sun for several hours. This measure served to effectually prevent the development of any dampness or mustiness about the tents. Three times during the encampment of the First Battalion at Montchanin the whole battalion slightly shifted ground, twice by shifting northward about the distance of the length of a tent and the other time eastward and northward about the same distance.

Rigid inspections of quarters were held at frequent intervals. Every Sunday morning the commanding officer, accompanied by his staff, made the rounds of the camp, entering every tent and carefully going over its contents. The men stood at attention in the company streets during the performance of this function and the least evidence of lack of care in the proper attention to the cleanliness of his tent or accouterments was at once used to serve as the occasion of a lecture to the guilty man. Saturday mornings company inspections were held, and every man's personal equipment was carefully scrutinized. The water supply at Montchanin came from an excellent well located about 50 yards from the camp. A guard was kept constantly at this point and no waste of water allowed and any chance of its pollution carefully guarded against. Toward the end of the summer the well became somewhat low, and our water supply was supplemented by piping water from a private reservoir in the neighborhood. The water at Penngrove was for the most part derived from a driven well and was abundant and wholesome throughout the entire season.

The utmost care was taken in entries made in the morning sick books. It is customary in most regiments to mark a man who is slightly indisposed as capable of police duty. This means that he is able to aid in the cleaning or "policing" of the camp. These men not only pick up stray paper, etc., about the camp, but are very apt to be given work about the kitchens, cutting potatoes, paring onions, etc. Now, during the summer season the vast majority of cases that report at morning sick call have diarrhea. Under such circumstances there is no doubt that many times men in the first stage of typhoid fever, or possibly suffering from a fully developed case of "walking" typhoid, are put at work

just where they have no business to be—about the kitchens. We made it an invariable rule never to allow men with any bowel disturbance to be about the kitchen, under any pretext.

Each of the battalions had a large hospital tent for its sick. These tents were provided with board floors and cots, and were kept always in a perfectly clean and neat condition. Too much credit can not be bestowed upon our two stewards, Simmons and Rothwell, for the care they took of their patients and their zeal in maintaining their hospitals in proper condition. The other men in the hospital corps were all carefully picked, four of them for each battalion, and they were throughout faithful and zealous in the performance of their duties. There was at no time any difficulty in procuring supplies, either directly from the Government or else by purchase from druggists, authorized by the Surgeon-General.

The most conspicuous cause, however, for this cheerful condition of affairs in the regiment's various camps is to be found in the fact that the colonel, lieutenant-colonel, and the company officers appreciated in the highest degree the necessity for the most absolute obedience to sanitary rules and regulations, and maintained the highest degree of cleanliness on the part of the men, both as regards their persons and equipment. This rendered complaints of the irksomeness of the discipline kept up quite a feature of the early part of the service, but toward the end of the regiment's stay in camp there is no doubt the men had learned to appreciate the absolute necessity of the measures adopted to preserve their health.

As regards the character of the enlisted men in the Second Pennsylvania Volunteer Infantry, there was great variety. Many of the younger men were the sons of parents whose station allowed them to afford their sons every luxury. Many of the older members of the regiment had given up profitable situations from patriotic motives or because they were thrilled by the excitement that was in the air. On the other hand, many of the men were drawn from the vast ranks of the unemployed. And yet others were genuine hoboes, whose one longing was for an easy berth. Fortunately, of the latter we had but few, and most of them were eliminated by various means before we returned to Philadelphia. With a body of men of such a heterogeneous nature to attain the results which were undoubtedly achieved, required great firmness and rigid enforcement of discipline.

When we arrived at the Philadelphia depot there were three men unable to march to the armory with the regiment. Two of them were suffering with sprained ankles and one had a severe cold. Three men were absent in Philadelphia at the time we left camp. We left no sick behind, and of those who returned all were in good physical condition, with the exception of those mentioned above.

COMMUNICATION CONCERNING SANITARY PRECAUTIONS
EMPLOYED IN THE SECOND BATTALION OF THE SECOND
PENNSYLVANIA VOLUNTEER INFANTRY. BY LIEUT. AND
ASSIST. SURG. R. P. ROBBINS.

I take pleasure in making a brief statement of some of the measures which were employed in the Second Regiment in its various camps at Montchanin, Del., and Pennngrove and Pompton Lakes, N. J. We were ordered to Mount Gretna by the governor of Pennsylvania on the 28th of April, and on the 13th of May the ten companies of the regiment having been recruited up to the maximum of 75 men per company, we were mustered into the service of the United States. On the 18th of May the Second Battalion of the regiment, consisting of companies A, C, F, H, and K, was ordered to Pompton Lakes, N. J., to guard the Lafin & Rand Smokeless Powder Works. I was detailed to go with this battalion as medical officer. We remained, however, at Pompton Lakes but one week, when we were ordered to Pennngrove, N. J., to guard the smokeless powder works of the E. I. Dupont de Nemours at Carneys Point. We remained at Pennngrove until the 6th of September. In the latter part of May or early in June the companies were recruited up to the maximum of 106 men. This gave us at Pennngrove 530 enlisted men and 19 officers, rather a large force for one medical officer to keep in health. We were very fortunate in having as commander of the post (for such it became) so intelligent and soldierly a man as Lieut. Col. Henry T. Dechert. Colonel Dechert took a most profound and intelligent interest in the hygiene of the camp. The suggestions made by the medical officer were investigated and indorsed by him, and very often the post surgeon was indebted to him for timely and thoughtful suggestions regarding the camp and its sanitation. We possessed a great advantage in being encamped in a grove on the banks of the Delaware River, the water of which at that point is brackish at flood tide. The wreck of an old schooner lay immediately off the river bank, and on this I built the sink for the men of the battalion. A foot of water at least covered the bottom of this sink even at ebb tide, and all excreta were completely carried away by the tides. It was therefore only necessary for us to keep the framework of this sink scrubbed with corrosive sublimate solution in order to have it perfectly sanitary.

The framework of the officers' sink was made of light shingling lath, and the sides and roof were covered with ordinary unbleached muslin. I found that when this muslin is stretched very tightly over the framework the rain is shed off and does not run through. The materials of which this sink was constructed insured thorough ventilation. The well of the sink was 7 feet in depth. Every morning two of my hospital corps covered the bottom of this well with quicklime and poured water on it and allowed it to slake. An hour or so afterward

one man with a shovel covered the lime and everything else with dry earth or sand. In this way the complete oxidation of all excreta was insured, and the larvæ of the flies were destroyed.

Our water supply at first was derived from wells in the neighborhood, which were kindly placed at our disposal by the owners. Later on it was thought best for us to have our own water supply, and a pipe was sunk about 25 feet from the river, within the limits of our camp, and a cucumber pump applied to it. This pipe struck an ample supply of water at a depth of 16 feet. At Colonel Dechert's suggestion I had this water analyzed, both chemically and bacteriologically, by the bureau of health, department of public safety, Philadelphia, which analysis showed that the water was perfectly potable.

There were five company kitchens in camp, one for each company. These kitchens were simply large tents or tent flies. In them we used the Lazard portable range for the purpose of cooking, and an auxiliary fire was built on the outside to supplement this range, which was not quite sufficient for all purposes. The food was issued to the company quartermaster-sergeants every morning by the acting post commissary, Lieut. Walter W. Bell, whose long experience as commissary sergeant, First Brigade, Pennsylvania National Guard, made him an admirable post commissary. Twice a week, at least, I was present and personally inspected the food issues. Every day I inspected the kitchens and investigated the methods of food preparation. I have no hesitation in saying that while the supply of food was not unbounded, it was ample for all purposes. Fresh meat, in the shape of beef, was issued four times a week, bacon once, pork occasionally, fish once. Potatoes, coffee, salt, and onions were issued every day; rice occasionally. Bread of excellent quality was also issued. Some of the company cooks were very expert in preparing inviting stews or soups or hashes. Of course, there was occasional complaint on the part of enlisted men that they did not get enough or that their food was not good enough. These complaints were always at once investigated and generally ascertained to be unfounded. I should say that the army ration as we had it was admirably adapted to the climate in which we were living. In a tropical climate it might be better to increase the vegetable and decrease the meat issue, but I strongly advocate the continuance of the coffee in the ration. I do not know of anything that could take its place.

The tents of the enlisted men were inspected formally every Sunday. Informally I inspected some companies' tentage every day. If the tents smelled at all close or the ground seemed musty, the canvas was ordered to be taken down and aired and the ground was sunned. Once every ten days all the canvas in camp was taken down and remained down for at least six or seven hours. A sunny day was chosen, and the ground and canvas were therefore well aired. I con-

sider this a most important measure, especially as we were, to a certain extent, short of canvas, and 5 men were sleeping in each A wall tent.

I have now given, as far as I could, a short description of the measures which we took to prevent disease in our little camp. I think I can safely say it was to these measures that we owe the wonderful record which the regiment made, for the same precautions were taken by the surgeons with the first battalion in camp at Montchanin. We were away for nearly five months, and during that time we had but one death.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORT.

May.—(State camp, Mount Gretna, Pa.) The Second Pennsylvania was a ten-company regiment, consisting of Companies A to K, inclusive. It remained in camp at Mount Gretna, Pa., entire, from May 5 up to the 18th, when one battalion, the Second, departed for service in the State of New Jersey. On the following day the remaining companies, constituting the First Battalion, departed for service in the State of Delaware. Total mean strength up to division: Officers, 40; enlisted men, 816; total, 856.

May.—(Mount Gretna, Pa., and Montchanin, Del.) Mean strength (of the First Battalion) averaged for twenty-seven days: Officers, 21; enlisted men, 443; total, 464. Admissions, 99; returned to duty, 94. Remaining on sick report: In hospital, 1; in quarters, 5.

Abstract of remarks by Maj. Herman Burgin, surgeon:

Companies A, C, F, H, and K left Mount Gretna, Pa., going to Pompton, N. J., May 18, with Robert J. Robins, first lieutenant and assistant surgeon, accompanying as medical officer.

Companies I, E, D, B, and G left Mount Gretna, Pa., going to Montchanin, Del., May 19, with Herman Burgin, major and surgeon, and Francis R. Packard, first lieutenant and assistant surgeon, accompanying as medical officers.

Companies A, C, F, H, and K left Pompton, N. J., going to Penn Grove, N. J. Robert P. Robins, first lieutenant and assistant surgeon, accompanied battalion as medical officer.

May.—(Second Battalion, Companies A, C, H, F, and K. Pompton, N. J., and Penn Grove, N. J.) Mean strength averaged for — days: Officers, 19; enlisted men, 373; total, 392. Admissions, 5; returned to duty, 5.

Abstract of remarks by Lieut. R. P. Robins, assistant surgeon:

In compliance with orders, a detachment consisting of five companies of the Second Regiment Pennsylvania Volunteer Infantry (19 officers and 373 enlisted men) left Mount Gretna, Pa., and proceeded to Pompton Lakes, N. J., to guard the Laffin & Rand Powder Works.

In compliance with orders, the detachment broke camp at Pompton Lakes on Thursday, May 26, 1898, and proceeded to Penn Grove, N. J., to guard the powder works of the E. I. Dupont de Nemours Company, the command having traveled 140 miles.

June.—(Battalion consisting of Companies I, E, D, G, and B. Montchanin, Del.) Mean strength averaged

for thirty days: Officers, 23; enlisted men, 474; total, 497. Remaining from last month, 4; admitted from command, 68; total to account for, 72. Of 66 completed cases, 65 returned to duty; 1 discharged for disability. Remaining on sick report, in hospital, 1; in quarters, 5.

Abstract of remarks by Maj. Herman Burgin, surgeon:

In addition to this list copied from the register of patients, there were 656 dispensary cases which came up for ailments that did not call for excusing the men from duty.

NOTE.—From the battalion consisting of Companies A, C, F, H, and K, at Penn Grove, N. J., there is no monthly sick report for June.

July.—(Companies I, E, D, B, and G. Montchanin, Del.) Mean strength averaged for thirty-one days: Officers, 23; enlisted men, 474; total, 497. Remaining from last month, 6; admitted from command, 149; total to account for, 155. Of 147 completed cases, 146 returned to duty; 1 discharged for disability. Remaining on sick report, in hospital, 2; in quarters, 6.

July.—(Penn Grove, Pa. Companies A, C, F, H, and K.) Mean strength averaged for thirty-one days: Officers, 19; enlisted men, 530; total, 549. Admitted from command, 150; total to account for, 150. Of 146 completed cases, 145 returned to duty and 1 transferred to other hospital. Remaining on sick report, in hospital, 4.

August.—(Montchanin, Del. Companies I, E, D, G, and B.) Mean strength averaged for thirty-one days: Officers, 23; enlisted men, 528; total, 551. Remaining from last month, 8; admitted from command, 170; total to account for, 178. Of 163 completed cases, 159 returned to duty; 3 discharged for disability; 1 otherwise disposed of. Remaining on sick report, in hospital, 2; in quarters, 13.

Abstract of remarks by Maj. Herman Burgin, surgeon:

Camp remarkably clean and very healthy. In addition to the cases in the register, there are 730 dispensary cases, mostly trivial. For future reference, record was kept of them.

August.—(Penn Grove, N. J. Companies A, C, F, H, and K.) Mean strength averaged for thirty-one days: Officers, 19; enlisted men, 523; total, 542. Remaining from last month, 5; admitted from command, 72; total to account for, 77. Of 72 completed cases, 70 returned to duty; 1 died; 1 discharged for disability. Remaining on sick report, in hospital, 5.

The report bears no signature and there are no remarks.

September 1 to 6.—(Penn Grove, N. J. Companies A, C, F, H, and K.) Mean strength averaged for six days: Officers, 19; enlisted men, 524; total, 543. Remaining from last month, 6; admitted from command, 8; total to account for, 14. Of 14 completed cases, 9 returned to duty and 5 were transferred to other hospital.

Abstract of remarks by Asst. Surg. R. P. Robins:

Under orders September 5, 1898, the battalion broke camp at Penn Grove, N. J., and proceeded to Montchanin, Del., rejoining the other five companies of the regiment. The 5 men remaining sick were transferred to the regimental hospital, and the results will be there noted. The movement took place on the 6th of September.

No typhoid, intestinal, or malarial cases reported.

September.—(Montchanin, Del., and Philadelphia, Pa.) Mean strength averaged for thirty days: Officers, 38; enlisted men, 456; total, 494. (Evidently for only Companies I, E, D, G, and B.) Remaining from last month, 15; admitted from command, 151; transferred, 5; total to account for, 171. Of 170 completed cases, 166 returned to duty; 2 discharged for disability; 2 otherwise disposed of. Remaining on sick report, in hospital, 1.

Abstract of remarks by Maj. Herman Burgin, surgeon:

The Second Battalion was transferred on September 6, 1898, from Penn Grove, N. J., to Montchanin, Del., thus relieving Assistant Surgeon Robins of responsibility. * * * On September 15 the regiment left Montchanin for Philadelphia, where on the same day a furlough of thirty days was granted all men, with the exception of 81 who were detailed for guard duty. As in addition to these 81 men there are quartered in the armory a number of men who live at a distance, I have arranged that at least one medical officer and hospital steward shall be at the armory all the time. The sanitary condition of the camp was excellent. The health of the regiment was good, and the men came back in far better physical condition than when they went out. The cases in camp were such as would develop in any large body of men, and at no time were any of them due to true camp diseases.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE SECOND PENNSYLVANIA VOLUNTEER INFANTRY.

Brief outline of the medical history.—This ten-company regiment responded to the first call for volunteers, and leaving its National Guard armory in Philadelphia, Pa., on the 28th of April, 1898, arrived the same day at Camp Hastings, the State camp at Mount Gretna, Pa., a customary point of mobilization for the National Guard of that State. The companies having been recruited to the National Guard maximum of 75 men each, the regiment was mustered in on the 13th of May. On the 18th of that month the Second Battalion (Companies A, C, F, H, K) left Mount Gretna, Pa., for Pompton Lakes, N. J., where it remained only one week, being ordered to Penn Grove, in the same State. On the 25th of May this battalion went into camp on the east bank of the Delaware River, in the edge of the village of Penn Grove, N. J., and was assigned to the duty of guarding the Smokeless Powder Works of the Duponts at Carneys Point. The Second Battalion remained encamped here until the 6th of September, when it joined the First Battalion at Montchanin, Del. On the 19th of May the First Battalion (Companies I, E, D, B, G) left Mount Gretna, Pa., for Montchanin, Del.,

to guard other powder works of the Duponts located on the banks of the Brandywine above the city of Wilmington, Del. It remained encamped at Montchanin performing this guard duty, practically upon one camp site the whole time, until the 6th of September, on which date it shifted ground slightly to the east and was joined on the west by the Second Battalion, which arrived that day from Penn Grove, N. J. The whole regiment now remained encamped at Montchanin, Del., until the 15th of September, on which date the command left this camp for the city of Philadelphia, Pa., under orders to be mustered out. It arrived in its National Guard armory in that city on the same day and immediately dispersed on a thirty days' furlough, which was later extended, meanwhile leaving on guard in the armory 81 men, besides a few men of the regiment quartered there during the furlough whose homes were at a distance. Although the Second Pennsylvania was not mustered out of the service of the United States until November 15, 1898, at its National Guard armory in the city of Philadelphia, Pa., we have been unable to find any monthly sick report of this regiment for the months of October and November.

It should be especially noted that during the whole term of its service under the United States Government the Second Pennsylvania Volunteer Infantry had no connection or association with any brigade, division, or corps of the Volunteer Army, and was not once in or near to any national camp; and that immediately upon leaving its State camp at Mount Gretna, Pa., it separated into two battalions of about even strength, which remained apart at isolated stations until within nine days of the end of its field service.

The medical history of this regiment is therefore surrounded by very exceptional associations and circumstances. It covers a period of five months and three days. Of this time, twenty-one days were passed in the State camp at Mount Gretna, April 28 to May 18; the First Battalion spent one hundred and nineteen days in camp at Montchanin, Del., from May 19 to September 15; the Second Battalion passed seven days at Pompton Lakes, N. J., May 18 to 25; one hundred and four days at Penn Grove, N. J., on the east bank of the Delaware River, May 25 to September 6, and nine days at Montchanin, Del., after joining the First Battalion there, September 6 to 15. After September 15 the regiment was dispersed for more than thirty days, leaving more than 81 men on guard in its National Guard armory in the city of Philadelphia, Pa.

The experience of this regiment as to typhoid fever appears to be almost as unusual as were its exceptional associations and surroundings. In the estimation of one of its medical officers only 1 case—possibly 2 cases—of typhoid fever developed in the Second Penn-

sylvania during its whole field service (the certain case in the Second Battalion and the possible case in the First Battalion). The board estimate that there were during this period of field service one certain case of typhoid fever, one case of probable typhoid (in the Second Battalion while at Penn Grove, N. J.), and three prolonged febrile attacks (in the First Battalion at Montchanin, Del.), which we have regarded as undoubtedly suspicious and have added in the sum total of probable attacks of typhoid fever, thus counting a total of 5 probable cases of typhoid fever developed during this period of field service, as against the 2 possible cases reckoned by one of the medical officers of the regiment above mentioned. Furthermore, by reference to the following tabular statement of sickness in this regiment it will be seen that from the 15th of September, the day the command returned to Philadelphia, Pa., under orders to be mustered out, up to the 22d of September, both inclusive, four serious attacks occurred. Of these, we have classed 2 as certain typhoid, 1 as probable typhoid, and 1 as prolonged febrile or malarial, and we have added them all to the sum total of probable typhoid. Of the attacks developed after the departure of the regiment from Montchanin for home it should be remembered that 2 cases of certain typhoid were probably infected before the regiment left Montchanin, and the same may be said also of the one attack of probable typhoid. The latter occurred in the First Battalion and the former in the Second Battalion. The one prolonged febrile attack should also be credited to the camp at Montchanin, Del., as having been infected there. It is worthy of remark that 44.44 per cent of all the serious sickness developed within seven days after returning from Montchanin, Del. Thus we obtain for this regiment only 9 cases of probable typhoid fever—a remarkably low figure. As to the four attacks classed as prolonged febrile or malarial, we are free to admit that there is considerable room to doubt if they are all really of a typhoidal nature, and that to this extent we may have overestimated the true prevalence of typhoid fever in this regiment.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (typhoid included) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained. For details of the method and system of examination, nomenclature, and classification pursued in these tabular statements, we would refer to the introductory remarks at the commencement of the Second Army Corps.

[Second Pennsylvania Volunteer Infantry; mean strength, 979.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Total probable typhoid, including long malaria.	Deaths from diseases	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.		Typhoid.	All other.
May.....	24	1	.....	22	33	1	.....	.....	1	.....	.....
June.....	17	3	.....	20	6	1	.....	.....	1	.....	.....
July.....	91	3	.....	94	15	.....	.....	.....	.....	.....	.....
August.....	65	4	.....	69	11	.....	1	1	2	1	.....
September.....	34	1	1	36	11	2	1	2	5	.....	.....
October.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....
November.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
Total.....	228	12	1	241	79	4	2	3	9	2	.....

The above tabulated deaths from disease by months were distributed among the companies as follows:

	Company.		Total.
	D.	F.	
Typhoid.....	1	1	2

The following is a series of three tables showing by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders, in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such other attacks.

Combinations of typhoid fever in the Second Pennsylvania.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.			
Certain typhoid (uncombined)	1					1							2
Probable typhoid (uncombined)					1	1							2
Typhoid preceded by diarrhea.	1												1
Total certain typhoid	2					1							3
Total probable typhoid.					1	1							2
Total probable and certain typhoid.	2				1	2							5

This regiment has but 10 companies, from A to K, inclusive.

Combinations of continued or malarial fever in the Second Pennsylvania.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.			
Short malaria (uncombined).....	1	8	1	6	6	2	7	2	7			40	
Short malaria preceded by diarrhea.....	1			2	2		2	1				8	
Short malaria followed by diarrhea.....	1			3	4		3					11	
Double short malaria followed by diarrhea.....		1			1							2	
Two attacks short malaria.....		1			1							2	
Long malaria (uncombined).....					1					1		2	
Long malaria preceded by diarrhea.....					1							1	
Long malaria followed by diarrhea.....				1								1	
Total short malaria.....	1	14	1	11	18	6	16	3	9			79	
Total long malaria.....				1	2					1		4	

Totals include malaria in typhoid combinations.

Intestinal disorders in the Second Pennsylvania.

	Company.										Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.		
Single short diarrhea.....	7	23	21	15	26	10	23	5	16	9	2	157
Two attacks short diarrhea.....	.....	2	1	4	7	1	1	4	.....	.....	.....	20
Short and long diarrhea.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	2
Short and prolonged diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1
Single long diarrhea.....	.....	.....	1	.....	1	.....	1	.....	2	1	.....	6
Prolonged diarrhea.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Total diarrhea.....	8	30	30	29	51	12	31	13	25	10	2	241

Totals include diarrhea in malaria and typhoid combinations.

The records of sickness in this regiment were more or less incomplete and to some extent conflicting. By way of illustration: We have been unable to find any sick report of the Second Battalion for the month of June, and although this regiment was not mustered out until November 15, 1898, no monthly sick report later than September has been found. Furthermore, 7 cases of so-called febricula, or short malaria, have been recorded, without any mention of their final disposition. The duration of these cases being unknown to us, we could draw no inferences as to their true character, yet were obliged to classify them as febrile attacks lasting less than ten days. Moreover, we have encountered 1 fatal case of typhoid fever of which the only sick record is the death return on file in the Adjutant-General's Office. On the whole, we can not but feel that the foregoing tabular statement is a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Second Pennsylvania Volunteer Infantry (unattached to any brigade, division, or army corps, and never having entered one of the large national military camps during the term of its United States service) may be recapitulated in the following condensed form:

(*a*) The regiment (of 10 companies) was in its State camp at Mount Gretna, Pa., from April 28 to May 18 and 19, respectively; the First Battalion (of 5 companies) was encamped at Montchanin, Del., on special guard duty, from May 19 to September 15; the Second Battalion was on special guard duty at Pompton Lakes and Penn Grove, N. J., from May 18 to September 6, and at Montchanin, Del., in camp with the First Battalion, from September 6 to 15; the regiment (10 companies) returned to its National Guard armory in the city of Philadelphia September 15 and immediately dispersed, leaving 81 men on guard; it was mustered out November 15, 1898. The initial date of the first attack suspicious of typhoid fever was May 26, of the first certain attack of typhoid fever about August 7. One suspicious case of long-continued fever developed within the incubation period of typhoid fever after leaving the State camp at Mount Gretna, Pa. Whether or not this regiment carried from the State camp to the

camps where it passed the summer the infection of typhoid fever is, therefore, a matter of some doubt. However this may be, it is certain that the command, although experiencing a very few scattering cases, had no epidemic of typhoid fever during its whole term of field service under the United States Government. The medical history of this regiment as given by the board covers a period of five months and three days (from April 28 to September 30, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 241; of so-called febricula, malaria, etc., 79; of so-called long malaria, etc., 4; of probable typhoid fever, 2, and of certain typhoid fever, 3. Total attacks of probable typhoid fever (including long malaria, etc.), 9.

(c) Total deaths from typhoid fever, 2; total deaths from all diseases, 2; mortality per cent of total probable typhoid attacks, 22.22; of total certain typhoid attacks, 66.66; per cent of typhoid deaths to all deaths by disease, 100.

(d) The mean strength was 979. The per cent of typhoid morbidity to mean strength: As to total probable typhoid attacks was 0.92, while the average for 12 regiments of the Second Army Corps at Camp Meade, Pa., was 19.26; as to total certain typhoid attacks was 0.32, while the average for the same 12 regiments was 12.88. The number of typhoid deaths per 1,000 of mean strength was 2.04, while the average for the same 12 regiments of the Second Army Corps at Camp Meade, Pa., was 10.74.

MALARIAL DISEASES AT CAMP MEADE, PA.

With regard to the prevalence of malarial fevers at this camp, we may state that, having followed with much care the cases of malarial fever reported by the medical officers of the 13 regiments whose histories are here given, we have found the diagnosis, in a large majority of cases admitted to division hospitals, afterwards changed to that of typhoid fever. This would appear to indicate that malarial fevers were not prevalent at Camp Meade. Concerning this matter Acting Asst. Surg. George Dock, who visited this camp during the third week in September for the purpose of making blood examinations, says:

When I arrived at Camp Meade I found comparatively few cases with the diagnosis of malaria in the Second Division Hospital. Most of the surgeons claimed that malarial disease was very rare there. I found two wards, the so-called malarial wards (3 and 4), in which a great many cases had the diagnosis of malaria. I examined the blood of many of these, also of many recently admitted men and some suspicious cases in other wards to the number of 20, but without finding any parasites. As the bacteriological outfit was incomplete, Widal tests could not be made; but out of the so-called malarial cases at least two-thirds were evidently typhoid in the middle stage, some not yet definitely recognizable, and some convalescent.

In the First Division Hospital I was told there were a great many cases of malaria and typho-malarial fever. Several so-called typical cases of the latter had no parasites and were evidently uncomplicated cases of typhoid fever. One case proved to be malaria, and is quite as instructive as the positive case found at Chickamauga.

Private Beyer, Company F, Fifteenth Pennsylvania, came two weeks before examination from Point Sheridan, on the Potomac River. Four days later he began to have chills, and had, so far as he knows, three chills. He felt quite well the free days. The temperature had not been taken often enough to give the type. There had been a chill the day before examination, and the patient had taken 24 grains of quinine in two days. Soon after beginning the examination I found an organism almost filling a red blood corpuscle. * * * Like the case previously described (at Chickamauga), he came to camp already infected. To summarize: I found remarkably little evidence that malaria was prevalent in Camp Meade, the only case found being imported.

The evidence of so competent an observer, based on blood examinations made at Camp Meade, is of great importance in determining the slight part which malaria played as a factor in the fevers at this camp. We have been inclined to look upon many of these short (less than ten days) fevers, of supposed malarial character, as really cases of mild infection with the typhoid bacillus.

We have already given the result of our investigations bearing on this point in nineteen regiments of the Second Army Corps at Camp Alger, Va. We have repeated the same patient investigation of the subsequent history of all of these supposed malarial fevers in thirteen regiments of this corps at Camp Meade, Pa., in order to ascertain whether these men possessed a relative immunity to typhoid fever as compared with those men who did not experience these milder fevers. The results are given in the following table:

Table showing cases of typhoid fever among men with and without preceding malarial diseases in thirteen regiments, Second Army Corps, at Camp Meade, Pa.

Regiment.	Mean strength.	Cases of malaria.		Cases of malaria followed by typhoid fever.	Number of men without preceding malaria.	Typhoid cases without preceding malaria.		Total cases of typhoid fever.
		Number of cases.	In 100 malarial cases.			Number of cases.	In 100 men who have not had malaria.	
Third Connecticut	1,214	39	.....	.....	1,175	152	12.9	152
First Delaware	926	70	2	2.9	856	43	5.0	45
First Maryland	1,251	41	.....	.....	1,210	85	7.0	85
Fifth Massachusetts	1,275	108	.....	.....	1,167	53	4.5	53
Thirty-fifth Michigan	1,150	171	6	3.5	979	313	31.9	319
Fifteenth Minnesota	1,280	112	.....	.....	1,168	463	39.6	463
Fourth New Jersey	1,225	23	.....	.....	1,202	11	.9	11
Two hundred and first New York	1,076	196	13	6.7	880	160	18.2	173
Two hundred and second New York	1,125	222	10	4.5	903	140	15.5	150
Two hundred and third New York	1,047	153	26	17.0	894	454	50.8	480
Tenth Ohio	1,288	157	8	5.1	1,131	253	22.4	261
Second Pennsylvania	1,070	54	.....	.....	1,016	5	.5	5
Second West Virginia	1,165	84	7	8.3	1,081	173	16.0	180
Total	15,092	1,430	72	5.0	13,662	2,305	16.9	2,377

That is, of 1,430 individuals who were treated for malaria, 72, or 5 per cent, subsequently had typhoid fever of 13,662 men who were not treated for malaria, 2,305, or 16.9 per cent, had typhoid fever.

Or, of 2,377 cases of typhoid fever, 72, or 3 per cent, had previously been treated for malaria; of 2,377

cases of typhoid fever, 2,305, or 97 per cent, had no preceding malaria.

We therefore conclude that malarial diseases were rare at Camp Meade, and that a majority of the milder fevers, so designated, were really manifestations of infection with the typhoid bacillus.

THE RELATION OF INTESTINAL DISORDERS TO TYPHOID FEVER.

We have given, under the Second Army Corps at Camp Alger, Va., the result of our investigations with regard to the predisposition to typhoid fever which intestinal disorders are supposed to favor. We have there drawn the conclusion that, contrary to the generally accepted opinion, these intestinal disorders not only do not favor the development of typhoid fever in the affected individuals, but that they bring about a relative immunity to typhoid attacks. The following table will show that the same conclusion can be drawn from our investigations at Camp Meade:

Table showing cases of typhoid fever among men with and without preceding diarrheal diseases in thirteen regiments of the Second Army Corps at Camp Meade, Pa.

Regiment.	Mean strength.	Cases of diarrheal diseases.		Cases of diarrheal diseases followed by typhoid fever.		Number of men without preceding diarrheal diseases.	Typhoid-fever cases without preceding diarrheal diseases.		Total cases of typhoid fever.
		Number of cases.	Number of individuals.	Number of cases.	In 100 men with preceding diarrheal diseases.		Number of cases.	In 100 men not having diarrheal diseases.	
Third Connecticut.....	1,214	35	35	5	14.3	1,179	147	12.5	152
First Delaware.....	926	49	48	.....	.....	878	45	5.1	45
First Maryland.....	1,251	27	24	1	4.2	1,227	84	6.8	85
Fifth Massachusetts.....	1,275	205	190	4	2.1	1,085	49	4.5	53
Thirty-fifth Michigan.....	1,150	188	178	15	8.4	972	304	31.3	319
Fifteenth Minnesota.....	1,280	346	291	36	12.4	989	427	43.2	463
Fourth New Jersey.....	1,225	168	152	1	.6	1,073	10	.9	11
Two hundred and first New York.....	1,076	198	188	21	11.2	888	152	17.1	173
Two hundred and second New York.....	1,125	109	100	6	6.0	1,025	144	14.0	150
Two hundred and third New York.....	1,047	162	151	47	31.1	896	433	48.3	480
Tenth Ohio.....	1,288	318	286	42	14.7	1,002	219	21.8	261
Second Pennsylvania.....	1,070	236	207	1	.5	863	4	.4	5
Second West Virginia.....	1,165	7	7	.....	.....	1,158	180	15.5	180
Total.....	15,092	2,048	1,857	179	9.6	13,235	2,198	16.6	2,377

That is, of 1,857 individuals who were treated for intestinal complications, 179, or 9.6 per cent, subsequently had typhoid fever; of 13,235 men who had not been treated for intestinal complications, 2,198, or 16.6 per cent, had typhoid fever.

Or, of 2,377 cases of typhoid fever, 179, or 7.5 per cent, had previously been treated for diarrheal diseases; of 2,377 cases of typhoid fever, 2,198, or 92.5 per cent, had no previous intestinal complication.

ORIGIN AND SPREAD OF TYPHOID FEVER IN THE SECOND ARMY CORPS, AT CAMP MEADE, PA.

Every regiment that arrived at this national camp, whether coming from another general encampment, such as from Camp Alger, Va., or direct from State

camps, imported typhoid fever. There was no exception to this general statement. Of 25 regiments that reached this camp during the latter half of August and the first half of September, 18 were thoroughly infected with typhoid fever and 7 had already had from 2 to 8 cases of this disease. The origin of typhoid fever at Camp Meade is, therefore, clear.

For the course of the disease in the several organizations during the period August 15 to November 15, 1898, the period of occupancy of Camp Meade, the regimental histories and the graphic charts should be consulted. From a study of these it will be seen, as we have already repeatedly had occasion to remark in our summary of regimental histories, that typhoid fever at Camp Meade, as elsewhere, consisted essentially of a series of company epidemics, each one having more or less perfectly its own individual characteristics. The dissimilarities in the time of beginning and the course of the company epidemics, as well as their ending, would appear to be incompatible with the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means of origin and propagation of typhoid fever. Reference to the graphic charts gives ample evidence of these truths, and it is not necessary to illustrate further by entering into details. The course of typhoid fever in the various companies forming the regiments of the First and Second Divisions of the Second Corps at Camp Meade, Pa., was such as to conclusively eliminate any contamination of the general or company water supply.

We have already shown in the case of the Thirty-fifth Michigan, Fifteenth Minnesota, and Two hundred and third New York Infantry the result of our endeavors to ascertain the names of soldiers developing typhoid fever as they were grouped in their tents in the several camps. (For details see histories of these regiments.) Reference to the diagrams accompanying these regiments will show the manner in which the attacks of typhoid fever were grouped with regard to certain tents. These squad groups of the sick, as plotted in their tents, would appear to suggest a mode of disseminating infection which more effectively reached and acted upon certain limited groups of men while it passed by others. This would be, we think, entirely compatible with the assumption of a dominating tent, squad, or comrade infection. This would seem to hold true of any company epidemic which persists for any considerable time, whatever may have been the mode of the original infection. We have already stated, under the head of general remarks, that the general policing of the regimental camp sites was excellent and that the care of the company sinks, as regards the immediate covering of all excreta, was very satisfactory. We do not doubt that notwithstanding these sanitary precautions there were individual instances of what we have designated as sink infection, or that food was occasionally infected by flies. We believe, however, that squad or comrade infection was probably the most important factor concerned in the spread of typhoid fever at Camp Meade, Pa.

General table showing number and per cent of connectable typhoid attacks in tents in the Second Division of the Second Army Corps, as deduced from surgeons' tent lists.

[Three regiments of the Second Army Corps, Camp Meade.]

Regiment.	Attacks plotted.	Directly connectable attacks in same tents.		Indirectly connectable attacks in next tents.		Regimental totals, direct and indirect.	
		Number of connectable attacks of those plotted.	Per cent of connectable to all attacks plotted.	Number of connectable attacks of those plotted.	Per cent of connectable to all attacks plotted.	Number of connectable attacks of those plotted.	Per cent of connectable to all attacks plotted.
Thirty-fifth Michigan Volunteer Infantry	189	59	31.21	65	34.39	124	65.60
Fifteenth Minnesota Volunteer Infantry	436	199	45.64	118	27.06	317	72.70
Two hundred and third New York Volunteer Infantry	467	106	22.69	128	27.41	234	50.10
Total	1,092	364	33.33	311	28.48	675	61.81

Number and per cent of connectable typhoid attacks in tents in the Second Division of the Second Army Corps, as deduced from captains' tent lists.

[Two regiments of the Second Army Corps, Camp Meade.]

Regiment.	Attacks plotted.	Directly connectable attacks in same tents.		Indirectly connectable attacks in next tents.		Company totals, direct and indirect.		Regimental totals.	
		Number of connectable attacks.	Per cent of connectable to all attacks plotted.	Number of connectable attacks.	Per cent of connectable to all attacks plotted.	Number of connectable attacks.	Per cent of connectable to all attacks plotted.	Number of connectable attacks.	Per cent of connectable to all attacks plotted.
Thirty-fifth Michigan Volunteer Infantry:	0								
Company A	45	23	51.11	13	28.89	36	80.00		
Company L	29	7	24.13	8	27.50	15	51.73		
Total	74							51	68.91
Two hundred and third New York Volunteer Infantry:									
Company A	61	27	44.26	17	27.85	44	72.13		
Company C	45	16	35.55	10	22.22	26	57.77		
Company K	48	19	39.58	12	25.00	31	64.58		
Total	154							101	65.58
Grand total	228	92	40.35	60	26.31			152	66.66

General table showing average interval between connectable typhoid attacks in tents in the Second Division of the Second Army Corps, as deduced from surgeons' tent list.

[Three regiments of the Second Army Corps, Camp Meade.]

Regiment.	Attacks plotted.	Intervals of directly connectable attacks in same tents.			Intervals of indirectly connectable attacks in next tents.			Regimental totals.		
		Number of intervals between connectable attacks.	Aggregate days between connectable attacks.	Average days between connectable attacks.	Number of intervals between connectable attacks.	Aggregate days between connectable attacks.	Average days between connectable attacks.	Number of intervals between connectable attacks.	Aggregate days between connectable attacks.	Average days between connectable attacks.
Thirty-fifth Michigan Volunteer Infantry	189	33	334	10.1	45	442	9.8	78	776	9.9
Fifteenth Minnesota Volunteer Infantry	436	118	1,194	10.1	96	987	10.3	214	2,181	10.2
Two hundred and third New York Volunteer Infantry	467	56	606	10.8	86	873	10.1	142	1,479	10.1
Total	1,092	207	2,134	10.3	227	2,303	10.1			

Total number of intervals between connectable attacks 434
 Grand aggregate days between connectable attacks 1,436
 General average days between connectable attacks 10.2

Average interval between typhoid attacks in tents in the Second Division of the Second Army Corps, as deduced from captains' tent lists.

[Two regiments of Second Army Corps, Camp Meade.]

Regiment.	Attacks plotted.	Direct (same tent) intervals of connectable typhoid attacks.			Indirect (next tent) intervals of connectable typhoid attacks.			Company totals, direct and indirect.			Regimental totals.		
		Number of intervals between connectable attacks.	Aggregate days interval between connectable attacks.	Average days interval between connectable attacks.	Number of intervals between connectable attacks.	Aggregate days interval between connectable attacks.	Average days interval between connectable attacks.	Number of intervals between connectable attacks.	Aggregate days interval between connectable attacks.	Average days interval between connectable attacks.	Number of intervals between connectable attacks.	Aggregate days interval between connectable attacks.	Average days interval between connectable attacks.
Thirty-fifth Michigan Volunteer Infantry:													
Company A.....	45	14	149	10.6	15	143	9.5	29	292	10.0			
Company L.....	29	4	45	11.2	7	85	12.1	11	130	11.8			
Total.....	74										40	422	10.5
Two hundred and third New York Volunteer Infantry:													
Company A.....	61	15	145	9.6	15	145	9.6	30	290	9.6			
Company C.....	45	10	121	12.1	8	89	11.1	18	210	11.6			
Company K.....	48	11	124	11.2	12	119	9.9	23	243	10.5			
Total.....	154										71	743	10.4
Grand total.....	228	54	584	10.8	57	581	10.1				111	1,165	10.4

Average interval between diarrheal and typhoidal attacks in same individual in the Second Army Corps, as deduced from lists of diarrhea preceding typhoid fever.

[Eight regiments of the Second Army Corps, Camp Meade.]

Regiment.	Number of cases.	Aggregate days of interval between attacks.	Average days of interval between attacks.	Regiment.	Number of cases.	Aggregate days of interval between attacks.	Average days of interval between attacks.
Third Connecticut Volunteer Infantry.....	4	41	10.2	Two hundred and second New York Volunteer Infantry.....	1	12	12.0
Fifth Massachusetts Volunteer Infantry.....	2	21	10.5	Two hundred and third New York Volunteer Infantry.....	6	52	8.6
Thirty-fifth Michigan Volunteer Infantry.....	11	122	11.0	Tenth Ohio Volunteer Infantry.....	12	153	12.7
Fifteenth Minnesota Volunteer Infantry.....	26	306	11.7	Total.....	66	747	11.3
Two hundred and first New York Volunteer Infantry.....	4	40	10.0				

Mortality and morbidity from typhoid fever for the regiments of the Second Army Corps assembled at Camp Meade, Pa.

Regiment.	Mean strength.	Cases of typhoid fever.		Deaths from typhoid fever.	Deaths from all diseases.	Deaths from typhoid fever in 100 cases of—		Percentage of deaths from typhoid to deaths from all diseases.	Morbidity of typhoid fever in 1,000 mean strength—		Deaths from typhoid fever in 1,000 of mean strength.
		Certain.	Certain and probable.			Certain typhoid.	Certain and probable.		For certain cases of typhoid.	For certain and probable cases of typhoid.	
First Division, Second Corps.											
First Maryland.....	1,251	51	96	7	12	13.72	7.29	58.33	40.76	76.73	5.59
Thirty-fifth Michigan.....	1,150	269	385	21	25	7.80	5.45	84.00	233.91	334.78	18.26
Tenth Ohio.....	1,228	141	317	22	22	15.60	6.94	100.00	114.82	258.21	17.91
Third Connecticut.....	1,214	132	168	13	14	9.84	7.73	92.85	108.73	138.38	10.70
Two hundred and second New York.....	1,125	110	195	10	11	9.09	5.12	90.90	97.77	173.33	8.88
Fifteenth Minnesota.....	1,280	415	475	18	18	4.33	3.78	100.00	324.21	371.09	14.06
Total.....	7,248	1,118	1,636	91	102	8.13	5.56	89.21	154.24	225.71	12.56
Second Division, Second Corps.											
Fourth New Jersey.....	1,225	6	13	0	0	0	0	0	4.89	10.61	0
Two hundred and third New York.....	1,047	371	503	16	18	4.31	3.18	88.88	354.30	480.42	15.28
Second West Virginia.....	1,165	112	219	15	17	13.39	6.84	88.23	96.13	187.98	12.87
Fifth Massachusetts.....	1,275	43	66	3	3	6.97	4.54	100.00	33.72	51.76	2.34
Two hundred and first New York.....	1,076	119	195	19	21	15.96	9.74	90.47	110.59	181.22	17.65
First Delaware.....	926	30	58	6	7	20.00	10.34	85.71	32.39	62.63	6.46
Total.....	6,714	681	1,054	59	66	8.66	5.59	89.39	101.42	156.98	8.78
Total Second Corps.....	13,962	1,799	2,690	150	168	8.33	5.57	89.28	128.84	192.66	10.74
Second Pennsylvania.....	979	3	9	2	2	66.66	22.22	100.00	2.80	8.41	2.04

CHAPTER X.

TYPHOID FEVER IN THE FOURTH ARMY CORPS.

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TYPHOID FEVER IN THE FOURTH ARMY CORPS.

It is impossible to follow in the study of typhoid fever in this corps the same methods adopted in our studies of the First and Third Army Corps. In the first place, the regiments of the Fourth Army Corps were frequently changed, some going to other organizations and others coming from other organizations. The Fourth Army Corps assembled near Mobile, Ala., at the place which we have designated as Camp Coppinger. While at this place six regiments (the First and Second Alabama, the First and Second Louisiana, and the First and Second Texas) were detached from this corps and sent to Miami, Fla., where these regiments constituted the First Division of the Seventh Army Corps. A study of the medical history of these regiments will be found in the history of the Seventh Corps. The regiments left at Mobile after the detachment of the six regiments mentioned above subsequently were moved to Tampa, Fla., and its vicinity. Here the Fourth Corps was recruited by regiments sent from Chickamauga and others sent from State encampments. The regiments sent from Chickamauga to the Fourth Army Corps at Tampa were the Second New York Volunteer Infantry, the Sixty-ninth New York Volunteer Infantry, the Fifth Maryland Volunteer Infantry, and the First Ohio Volunteer Cavalry. The history of typhoid fever in these regiments has already been discussed in connection with the First and Third Army Corps. Other regiments—the Third Pennsylvania Volunteer Infantry, the One hundred and fifty-seventh Indiana Volunteer Infantry, and the First Ohio Volunteer Infantry—stopped for a few days at Chickamauga Park on their way from State encampments to Tampa.

Other regiments, such as the Fifth Ohio Volunteer Infantry, the Third Pennsylvania Volunteer Infantry, the Second Georgia Volunteer Infantry, the First Florida Volunteer Infantry, and the Thirty-second Michigan Volunteer Infantry, went directly from their State encampments to join the Fourth Army Corps at Tampa. It will be seen from the above that the histories of ten regiments (First and Second Alabama, First and Second Louisiana, First and Second Texas, Fifth Maryland, Second New York, Sixty-ninth New York, and the First Ohio Volunteer Cavalry), at one time attached to the Fourth Army Corps, have been given in connection with other organizations.

In the second place, the brigades of the Fourth Army Corps at Tampa were quite widely separated and the conditions of the various camps differed somewhat. One brigade (at that time the Third Brigade of the Second Division of the Fourth Army Corps), consisting of the First Ohio Volunteer Infantry, the One hundred and fifty-seventh Indiana Volunteer Infantry, and the Third Pennsylvania Volunteer Infantry, was encamped near Port Tampa City. The Second Brigade of the Second Division (consisting early in June, 1898, of the First District of Columbia Volunteer Infantry, Second New York Volunteer Infantry, and Fifth Maryland Volunteer Infantry) was encamped for a while in the vicinity of Old Fort Brooke. Later in June the First District of Columbia Volunteer Infantry went to Cuba and became attached to the Fifth Army Corps. The Fifth Ohio Volunteer Infantry, the Third Ohio Volunteer Infantry, the Thirty-second Michigan Volunteer Infantry, the First Florida Volunteer Infantry, and the Second Georgia Volunteer Infantry were encamped in De Soto Park and along Palmetto Beach, immediately southeast of Tampa.

The Fifth United States Cavalry, the Second United States Cavalry, and the First United States Volunteer Cavalry (until its departure for Cuba) were located immediately to the west of Tampa Bay Hotel. The Eleventh United States Infantry and the Nineteenth United States Infantry were located to the north of the city. There was also one brigade at Lakeland, Fla., some 30 miles distant from Tampa. In July the Nineteenth and Eleventh United States Infantry were sent to Porto Rico.

During the latter part of July a part of the Fourth Army Corps was moved to Fernandina, Fla., and later (during the latter part of August) the whole of this corps was transferred to Huntsville, Ala.

We will attempt to give the histories of only a few of the regiments of this corps. These will be sufficient to make us acquainted with the sanitary conditions of the camps occupied by this command. While we do not think that we have overestimated the number of cases of typhoid fever in these regiments, we desire to state that we can not be so positive on this point as we were concerning the regiments at Chickamauga, because, for the reasons to be stated later, we are convinced that malaria was much more prevalent among troops encamped about Tampa than it was in the First and Third Army Corps.

FIRST OHIO VOLUNTEER INFANTRY.

This regiment was mustered into service at Columbus, Ohio, May 6 and 7, 1898. It was transferred to Chickamauga Park, Ga., May 16. It remained at this place until June 1, and on June 2 arrived at Tampa, Fla. While at Columbus the regiment was supplied with city water. At Chickamauga it used exclusively water from driven wells. Captain Twitchell, in his testimony to us, stated that he observed that the water from these wells was occasionally cloudy. He claims that all the water used while at Chickamauga was boiled. The first sick report is for the month of May.

CONDENSED SICK REPORT FOR MAY.

Mean strength.....	832
Diarrhea.....	26
Dysentery.....	5
Other diseases.....	109
Total.....	140

Sore arms from vaccination and bruised feet from a forced march contribute a large number of cases to this report.

On reaching Tampa this regiment was stationed near Port Tampa City, and was brigaded with the Third Pennsylvania and the One hundred and fifty-seventh Indiana, constituting the Third Brigade of the Second Division of the Fourth Army Corps.

Both Major Hendley and Captain Twitchell of this regiment were quite confident, when we interviewed them at Fernandina, Fla., in August, that this regiment

reached Tampa quite free from any serious illness. An examination of the sick records supports in a general way this belief. However, there are two suspicious cases which had their initial date on June 1, the day before the regiment went into its camp at Port Tampa City. One of these was a private in Company C, who was taken with diarrhea June 1 and was not returned to duty until June 13. The second was a private in Company I, who, with a diagnosis of dysentery, remained off duty fourteen days from June 1. Both of these must be regarded as suspicious cases.

The water supply at Port Tampa City was obtained from three sources. Drinking water was brought in tank cars from Tampa. At first this was used exclusively for drinking purposes; later driven wells were put down in the rear of each battalion. These were supposed to furnish excellent water, but soon this supply was looked upon with suspicion. In addition to these sources water was piped through the camp from an artesian well at Port Tampa City. This also was a doubtful water, and soon an order was issued that it should be used only for watering stock. However, the water sent from Tampa in tank cars had to be hauled to the regiment in barrels; the roads were bad and the supply was insufficient, consequently the men drank the piped water and also that from the wells. An order was issued to boil all water, but, like all such orders, it was very difficult to enforce, and practically it was not enforced. There was no adequate provision for keeping patients at Port Tampa City, and the sick were sent to the division hospital at Tampa Heights or by means of hospital trains to Fort Thomas, Ky., or Fort McPherson, Ga.

As these cases were under the supervision of the regimental surgeons for only a few hours they could not be properly diagnosed; consequently the surgeons remained for some time in ignorance of the fact that they were developing typhoid fever in their regiments. The same difficulty was experienced in digging sinks at Port Tampa City as was met with at other encampments round about Tampa. When the sinks were dug the water would rise in them, often coming within a few inches of the surface. The regimental surgeons did everything in their power to keep the sinks in good condition. They purchased lime and sulphate of iron, which they used freely. They personally picked out the best places for digging the sinks, endeavoring to get them on higher ground. With the advent of the rainy season this site could no longer be occupied. The water stood from 6 to 18 inches deep over the camp ground. When this occurred the camp was moved about a mile distant across the railroad. An earnest attempt was made to have all the water used for drinking purposes boiled. Captain Twitchell states that this order was carried out more thoroughly in two companies than in the others, and that these companies suffered less from diarrhea and dysentery than did the

others. In regard to the prevalence of disease and the supply of water after moving the camp Captain Twitchell stated:

The condition of affairs grew steadily worse, and sickness became more prevalent. We boiled all water for the first three weeks. We did not have artesian water, but wells were sunk within the regimental lines to a depth of from 12 to 16 feet. Each company put in its own well at a cost of about \$15. The use of water from these shallow wells continued for about fourteen days. This water showed the presence of a large amount of chlorides. A drop of a solution of nitrate of silver in it produced a voluminous precipitate. After this a contract was made with a man who furnished artesian water.

When we inspected this regiment at Fernandina late in August Captain Twitchell stated:

We have not had a case of typhoid fever in the regiment. We have had intermittent and remittent fevers. There have been some cases that were doubtful. I would hesitate to say certainly that they were not typhoid fever, but I think that there were only 4 cases that I sent to the hospital that I might call doubtful typhoid fever. Most of these cases ran from six to fourteen days, after which they convalesced very slowly.

When asked his reason for diagnosing these cases as malaria Captain Twitchell responded:

The duration of the disease, the morning remission of temperature, the daily chills, the large, flabby, indented white tongue, indicate to me that these were cases of malaria. There were no rose-colored spots. In 2 cases the men had nosebleed. We have had 2 deaths up to this time. One man died at Fort Thomas, Ky., and another died from septic poisoning following vaccination in the Third Division Hospital.

In looking over the list of deaths furnished us from the Adjutant-General's Office we find that William E. Reynolds, of Company E, died at Fort Thomas, Ky., August 5, 1898, of typhoid fever. We fail to find in this list any record of a man dying from septic poisoning due to vaccination.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	889
Diarrhea.....	56
Dysentery	4
Other diseases.....	110
Total	170

This report is signed by Major Hendley, who states:

Twenty-four cases of ptomaine poisoning occurred on June 12, and were probably due to canned corn beef. The cooks stated that the cans were opened just before being used, possibly there was a defective can. Other messes were using the same goods with no bad results. The symptoms were vomiting, gastritis, great depression, and in 2 cases very weak pulse. Apomorphine was given hypodermically in nearly all cases, and this was followed by the administration of calomel and soda. Nine of the most severe cases required washing out the stomach. The heart depression was relieved by giving strychnine and nitro-glycerine hypodermically.

In looking over the June report we find 4 cases in addition to the 2 already given that might have been

typhoid fever. These were all diagnosed diarrhea, and remained off duty from fourteen days to five weeks.

During the stay of this regiment at Port Tampa City, there was no milk used by the men. Flies were very numerous and vicious in the camp.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,085
Typhoid fever.....	5
Diarrhea.....	101
Malaria.....	65
Dysentery	6
Other diseases.....	128
Total	305

It will be seen that while Captain Twitchell late in August claimed that there had been no typhoid fever in the regiment 5 cases are recorded in the July report. All the cases of malaria in this regiment are given as remittent fever with two exceptions, which are designated as intermittent.

It is interesting to observe at this point that there was no record of typhoid fever among the inhabitants of Port Tampa City during June and July, 1898.

With the advent of heavier rains in July it became impossible to dig sinks, and certain areas of ground were set apart for the reception of fecal matter, and these were surrounded with dykes to prevent the fecal matter from flowing through the camps.

This regiment remained at Port Tampa City until July 28, when it left for Fernandina, Fla. It remained at Fernandina until August 27, when it was transferred to Jacksonville, Fla., and became a part of the First Division of the Seventh Army Corps.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,050
Typhoid fever.....	1
Undetermined fever.....	5
Diarrhea.....	99
Malaria.....	190
Dysentery	3
Other diseases.....	225
Total	523

In this report all malarial cases with one exception are reported as remittent fever. Forty-seven of these were transferred to hospitals. Several of these transfers were not made until after the patients had been under treatment in the regimental hospital for more than two weeks. None of those sent to hospital were returned to duty before the expiration of the month.

At Fernandina the water supply was above suspicion, consisting of artesian well water distributed through the regiment in pipes. Sinks could be dug to proper depth, but were not well cared for.

We have no report from this regiment after August, but we have gone over the hospital reports for the month of September.

SUMMARY.

Assembled at Columbus, Ohio, in April, 1898.	
Mustered into United States service, May 6 and 7, 1898.	
Arrived at Chickamauga Park, Ga., May 16, 1898.	
Arrived at Port Tampa City, Fla., June 2, 1898.	
Strength on arrival at Tampa, 889.	
Date of first case of probable typhoid fever, June 1, 1898.	
Date of first case of recognized typhoid fever, July 22, 1898.	
Left Port Tampa City, Fla., July 28, 1898.	
Number of cases of probable typhoid fever developed at Port Tampa City	16
Arrived at Fernandina, Fla., July 28, 1898.	
Left Fernandina, Fla., August 27, 1898.	
Number of cases of probable typhoid fever developed at Fernandina, Fla	182
Arrived at Jacksonville, Fla., August 28, 1898.	
Number of cases of probable typhoid fever developed after reaching Jacksonville, Fla	23
Total number of cases of probable typhoid fever developed in the First Ohio Volunteer Infantry from May to September, 1898	221
These 221 cases were diagnosed as follows:	
Typhoid fever.....	27
Malaria.....	136
Diarrhea.....	58
Total.....	221

It should be understood that in giving the above figures we have followed the rule applied to all other regiments, and have included among the recognized cases of typhoid fever all cases diagnosed as typhoid fever in either regimental or hospital records.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Boyer, Charles K.....	Pvt., H.	1898. Oct. 17	Cincinnati, Ohio.....	Typhoid.
Cadwallader, W. W.....	Pvt., G.	Sept. 13	.....do.....	Do.
Craver, Alfred B.....	Pvt., M.	Aug. 16	Fernandina, Fla.....	Do.
Eastburg, Franklin.....	Pvt., D.	Oct. 8	Toledo, Ohio.....	Do.
Garber, William C.....	Pvt., C.	Aug. 28	Fernandina, Fla.....	(Typhoid); internal hemorrhage.
Jeffery, Ernest.....	Pvt., G.	Aug. 23	Columbus Barracks, Ohio.	Typhoid.
Jones, Thomas F.....	Pvt., C.	Sept. 25	Zanesville, Ohio.....	Do.
March, Wesley S.....	Sgt., M.	Sept. 24	Cincinnati, Ohio.....	Tuberculosis.
Reynolds, William E.	Pvt., E.	Aug. 5	Fort Thomas, Ky.....	Typhoid.
Smith, Michael.....	Pvt., M.	Oct. 18	Cincinnati, Ohio.....	(Typhoid); intestinal trouble.

Total deaths.....	10
Deaths due to typhoid fever.....	9
Percentage of deaths among probable cases of typhoid fever (221), 4.07.	
Percentage of deaths among recognized cases of typhoid fever (27), 33.33.	

COMMUNICATIONS FROM THE SURGEONS OF THE FIRST OHIO VOLUNTEER INFANTRY.

Medical officers.

Frank W. Hendley, major and surgeon, Cincinnati, Ohio.
 Gilbert I. Cullen, captain and assistant surgeon, Cincinnati, Ohio.
 Herbert E. Twitchell, captain and assistant surgeon, Cincinnati, Ohio.

Major Hendley quite seriously objects to the number of cases of probable typhoid fever which we have figured out for his regiment. He states:

Taking up your paper in detail, I would say the regiment arrived at Chickamauga May 16, being the first infantry volunteer regiment to arrive there, and was assigned to a location on the extreme right of the entire camp.

Our water supply at Chickamauga was derived from a driven well at the junction of the two roads at the edge of the camp. It stood at an elevated point far removed from sinks or other source of contamination. At first this water seemed to be of good quality and ample in quantity, but as other regiments crowded in the demand on this well frequently exhausted it. At these times water could be drawn again only after a rest of fifteen to thirty minutes; then the water was murky and cloudy and contained fine sand. These conditions would last until the well had been unused for several hours, when it would again flow freely and furnish a clear fluid.

I have no reason to believe that this well was contaminated by any disease germs at any time, but as it was evident that its ordinary supply was frequently exhausted, and consequently it drained a larger area than usual, it is impossible to judge how far it might have drained at those times when the demand for water was great and constant.

Doctor Twitchell is mistaken when he states that "all the water was boiled" at Chickamauga—he probably meant to say Tampa. Very little, if any, was boiled while we were at Chickamauga.

The regiment remained at this place fifteen days, leaving on June 1 for Tampa.

The diarrhea and dysentery reported in May was caused by the sudden change from the wet of the Columbus camp to the heat and improper food at Chickamauga. For ten days no meat but pork was supplied.

The only cases of serious illness at Chickamauga were 1 case of pneumonia and 1 of appendicitis, both of which were left in division hospital when the regiment moved to Tampa.

As to the cases referred to, which you regard as "suspicious of typhoid," beginning June 1, I would say the man of Company C (Joseph Brucker) unquestionably had only a simple diarrhea. He was sick in hospital two days and in quarters eleven days. His name does not again appear on sick report during the remainder of our service.

The man of Company I (Albert Caine) had dysentery pure and simple. He was a weak, nervous man who seemed to be unable to stand the weakening effect of the hot climate. He was on our hands constantly, and was relieved frequently from active duty and made company clerk. Neither of these cases can in justice or reason be classed as "suspicious" of typhoid.

At Tampa orders to boil all water were issued on the day of arrival, and reiterated on several occasions. The surgeons also put forth every effort to enlighten the men on the subject, and to urge company commanders to enforce the orders strictly. It is a fact that boiled water was furnished in every company, and the men urged to use it exclusively, but many did not like its taste and used other water secretly. My only regret is that men who were thus reckless and careless were not severely punished.

You say our sick were sent to hospital at Tampa, and on hospital train, and, to quote your language, "as they were under supervision only a few hours they could not be properly diagnosed, consequently the surgeons were in ignorance of the fact that they were developing typhoid in the regiments."

To this I would say that we sent very few to Tampa Hospital, none for six weeks, the first and only such being on July 16, when we sent 7 cases, of which 4 were surgical cases; 1 was diarrhea, which had been under observation eleven days; 1 malaria, seven days, and 1 diarrhea, three days.

On July 27 we sent 10 on hospital train, of which number 5 were diagnosed by us as typhoid fever, 3 as malaria, 1 as dysentery, and 1 was a surgical case. These cases had been under observation as follows:

Typhoid: One case thirteen days, 1 seven days, 1 four days, and 2 three days.

Malaria: One case thirteen days, 1 six days, and 1 three days.

Dysentery: Four days.

I will do you the justice to say that the case diagnosed as malaria of three days' observation did afterwards prove to be typhoid.

At the same time, I protest that the remark quoted from your paper should not apply to us, because it is evident that we gave more than a few hours to the observation of the cases and were not in ignorance of the true conditions.

I am aware that the surgeon of the One hundred and fifty-seventh Indiana Regiment—our immediate neighbors—persistently refused to acknowledge that he had any typhoid, even in the face of an autopsy made by him about this time which clearly showed the lesions of typhoid, but I object strongly to having this same remark applied to all surgeons in that brigade.

It is and always has been my belief that typhoid in our brigade at Port Tampa City originated in the Indiana regiment and reached the First Ohio about the middle of July, probably through the medium of flies, which became an intolerable pest at that time. That regiment had a number of men sick in its regimental hospital when they first reached Tampa, whereas our sick were almost exclusively "sick in quarters." Their men came exclusively from the country districts, such men being notoriously more subject to typhoid when in an army than men from the large cities. The practical decimation of the regiment by typhoid a month later at Fernandina might indicate the correctness of my theory that the focus of the typhoid in our brigade was the One hundred and fifty-seventh Indiana.

That regiment was unfortunately located at Port Tampa in such a position that the construction of proper sinks was impossible, and it was here that the system of dikes existed that is referred to in your paper.

Your remarks as to the water supply and the sinks at Tampa are correct in the main, but I would qualify by stating that it was not until about July 10 that the trouble with the sinks began. In our first camp at Tampa the sinks were located reasonably high and dry. After the removal—July 8—to the new camp ground, the sinks, owing to the nature of the ground, were on lower ground and were frequently flooded. Most of the sinks of the One hundred and fifty-seventh Indiana and the two companies of our regiment nearest to them could only be constructed on the dike plan mentioned in your paper.

Still following your paper in its order, I go back to the sick report for June, 1898, which shows:

Diarrhea.....	56
Dysentery.....	5
Malaria.....	1
Typhoid.....	0

The duration of these was as follows:

Diarrhea: Twenty-seven cases, one day; 9 cases, two days; 5 cases, three days; 3 cases, four days; 5 cases, five days; 3 cases, six days; 2 cases, seven days; 1 case, twelve days; and 1 case, twenty days.

Dysentery: One case, one day; 3 cases, two days; and 1 case, thirteen days.

The malaria case lasted two days.

Only 2 cases of diarrhea lasted over seven days, and only 1 case of dysentery over two days.

Of the cases beginning in June and carried over into July for completion, there were 7 cases of diarrheas lasting as follows: One case lasting one day; 2 cases lasting two days; 2 cases lasting three days; 1 case lasting 4 days; and 1 case lasting eleven days.

There was also 1 case of dysentery lasting thirty-three days, being Hospital Steward Auzanne. This was a true chronic dysentery, probably tubercular, and still persists to this day, more than one year in all.

Even including these cases, I fail to find in the sick register, of which I have preserved a copy, the 4 cases you refer to as being probably typhoid, but reported by us as diarrhea, and lasting fourteen days to five weeks, as your paper states.

There is only 1 case of diarrhea lasting fourteen days or more. The extreme limit of time is 1 case of diarrhea twenty days, and 1 case of dysentery thirty-three days, and even this last includes a case that is reported in July instead of June.

As to there being no record of typhoid fever among the inhabitants of Port Tampa City during June and July, 1898, I can only say that I have no reason to dispute that fact as to Port Tampa City, which is a small village, but as to the city of Tampa, from which part of the water supply came, I do not believe that the same statement could truthfully be applied.

Capt. Charles H. Castle, assistant surgeon, First Ohio Volunteer Cavalry, states that early in August he was in Tampa, and that one of the local physicians of that city told him that the city was overrun with typhoid, and he directed attention to the large number of funerals occurring daily.

Before we left Port Tampa City, July 28, it was admitted that typhoid fever existed in Tampa but not at Port Tampa City, and the military camps at Tampa Heights were blamed for introducing the disease.

The citizens of southern Florida are so anxious to preserve the reputation of their State as a "health resort" that their denials of the existence of any epidemic disease must be taken cum grano salis. The health officer at Fernandina said to me, "We never have any typhoid here; that disease is unknown. We have a continued fever, lasting three weeks or more, accompanied by diarrhea, but we have no typhoid."

Such a remark exhibits the reliability of the statistics furnished by these people.

You say "there is no report after August." Reports for September and October were sent by me to the Surgeon-General's Office, and from duplicates in my possession I send you the following abstracts:

September 1 to 13, inclusive (the regiment came home September 13 and was dispersed on verbal furlough for thirty days):

Total strength.....	1,312
Typhoid fever.....	0
Fever not determined.....	4
Malaria.....	96
Diarrhea.....	18
Dysentery.....	1
Other diseases.....	62
Total.....	181

Total sent to division hospital, 5 (Seventh Army Corps, First Division, Jacksonville).

Duration of illness (September report):

Fever not determined: One day, 1 case; two days, 1 case; three days, 1 case (sent to division hospital, George C. Heib, Company G); four days, 1 case.

Malaria: One day, 17 cases (1 sent to division hospital, George H. Williams, Company D); two days, 18 cases (1 sent to division hospital, Clyde Gall, Company I); three days, 9 cases; four days, 14 cases; five days 9 cases (1 sent to division hospital, William R. Mitchell, Company H); six days, 3 cases (1 sent to division hospital, Joseph Pfeffer, Company C); seven days, 6 cases; eight days, 2 cases; nine days, 5 cases; ten days, 3 cases; eleven days, 1 case; twelve days, 2 cases; thirteen days, 1 case; fourteen days, 2 cases; fifteen days, 1 case; seventeen days, 1 case; eighteen days, 2 cases.

Diarrhea: One day 7 cases, two days 5 cases, three days 1 case, four days 2 cases, five days 1 case, six days 1 case, and ten days 1 case.

Dysentery: Two days 1 case.

It will be seen from the above that of the 96 malarias only 10 cases exceeded ten days in duration, and all were returned to duty cured except 4 that went to division hospital, whose final diagnosis and disposition I can not state.

Of the 18 diarrheas not one exceeded ten days, and only 3 exceeded four days. A similar short duration existed as to the "un-

determined" fevers. I am therefore unable to understand upon what basis you found the presumption that we probably developed 23 cases of typhoid at Jacksonville.

Space does not permit me to add an analysis of the July and August reports, but inspection of them does not, to my mind, justify the large number you give to Fernandina and Tampa.

October record (being the final disposition of 29 incomplete cases carried over from September):

Malaria.....	23
Diarrhea.....	2
Pemphigus.....	1
Myalgia.....	1
Headache.....	1
Furuncle.....	1

It is impossible to report the duration of these cases, as the men all went home under verbal furloughs for thirty days, and all reported well for muster out at expiration of that time except one, whose case developed into true typhoid, and he reported well November 22.

About 6 or 8 additional cases of typhoid and very many cases of malaria and of jaundice developed during this furlough period among men who had exhibited no signs of any illness on the date they were released on furlough (September 16).

I would add that the total number of men on sick report from May to September, inclusive, in this regiment was only 719. As this includes all cases of sickness and of various surgical affections, it should be self-evident that there were not 221 typhoids among this number. A proportion of 30 per cent is impossible.

It is unfair to arbitrarily assume that the majority of our malarias and diarrheas were typhoid. I submit that it is unjust and destroys absolutely any value that might attach to statistics based on such assumption. We know positively what is the correct diagnosis of all the cases not sent to division hospitals. The only cases we grant possibility of error in are those thus sent away, in which further observation might result in a change of diagnosis.

Major Hendley adds to the above a list of the names of those sent to hospital and the number of days that each man was sick before being sent to hospital. In this list Major Hendley certainly demonstrates that his records were not well kept. He states that only 7 cases were sent to hospital at Tampa, 4 of which were surgical cases, 2 cases of diarrhea, and 1 of malaria. The hospital records show 11 cases of recognized typhoid fever and 3 cases of continued malaria from this regiment. The records of the general hospital at Fort Thomas show 12 cases of typhoid fever received from this regiment. Six of these were received from the corps hospital at Tampa, and yet Major Hendley states that only 7 cases were sent from his regiment to the Tampa hospital, no one of which was a case of typhoid fever.

Furthermore, Major Hendley states that our list of deaths in this regiment is not correct, and that Eastburg, Jeffery, and Jones did not belong to this regiment. This may be true. Our death list was obtained from the office of the Adjutant-General, and was furnished by the adjutant of the First Ohio Volunteer Infantry.

We have reported 27 cases of recognized typhoid fever in this regiment. It is well to state that only 9 cases of typhoid fever were recognized by the regimental surgeon, and in his corrected death list Major Hendley reports 4 deaths due to typhoid fever. This gives a death rate of 44.44 per cent.

THIRD PENNSYLVANIA VOLUNTEER INFANTRY.

The first report for this regiment covers the month of May, and is signed by Maj. Edward Martin without comment.

Only six companies are included in the sick report for this month.

CONDENSED SICK REPORT FOR MAY.

Mean strength	635
Typhoid fever.....	1
Tertian malaria.....	1
Diarrhea.....	14
Acute diarrhea.....	9
Gastroenteritis.....	1
Gastritis.....	1
Indigestion.....	1
Other diseases.....	46
Total.....	74
Admissions from command	74
Total to be accounted for	74
Completed cases:	
Returned to duty.....	69
Died.....	1
Discharged.....	1
Transferred to other hospitals.....	3
Total.....	74
Remaining on sick report:	
In hospital.....	3
In quarters.....	7
Total.....	10

The June report is signed by Major Martin without comment.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	634
Tertian malaria.....	6
Diarrhea.....	93
Acute diarrhea.....	3
Gastritis.....	4
Acute gastritis.....	1
Gastroenteritis.....	1
Indigestion.....	1
Other diseases.....	62
Total.....	171
Admissions:	
Remaining from last month.....	10
From command.....	161
Total to be accounted for.....	171
Completed cases.....	152
Returned to duty.....	159
Discharged.....	1
Transferred to other hospitals.....	1
Total.....	161
Remaining on sick report:	
In hospital.....	3
In quarters.....	7
Total.....	10

Only 6 companies, from A to H, inclusive, are mentioned in this report. During the month of June this regiment was at Port Tampa, Fla.

The July report is signed by Maj. Archibald Thompson, without comment.

CONDENSED SICK REPORT FOR JULY.

Mean strength	783
Typhoid fever	1
Tertian malaria	4
Quartian malaria	1
Malaria	53
Diarrhea	34
Acute diarrhea	34
Gastroenteritis	4
Acute gastritis	3
Gastritis	5
Indigestion	1
Dysentery	1
Cramps	1
Other diseases	96
Total	238

Admissions:

Remaining from last month	12
From command	226

Total to be accounted for	238
Completed cases	202

Returned to duty	191
Died	1
Discharged	2
Transferred to other hospitals	6
Otherwise disposed of	1
Total	201

Remaining on sick report:

In hospital	8
In quarters	28
Total	36

Only six companies are mentioned in this report. During this month, so far as the records show, this regiment was encamped at Port Tampa, Fla.

The August report is signed by Major Thompson, without comment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	984
Typhoid fever	9
Tertain malaria	1
Malaria	61
Malarial fever	3
Diarrhea	11
Acute diarrhea	41
Acute gastritis	3
Chronic diarrhea	3
Dysentery	1
Cramps	1
Other diseases	94
Total	228

Admissions:

Remaining from last month	36
From command	192

Total to be accounted for	228
Completed cases	218

Returned to duty	168
Died	2
Transferred to other hospitals	10
Otherwise disposed of	35

Total	215
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Remaining on sick report:

In hospital	5
In quarters	4
Total	9

It will be seen that the figures in this report do not account for all cases. However, we are compelled to give the figures just as they are. The August report shows that the regiment had been increased to ten companies. Sometime during August (date not given in the report) this command moved from Port Tampa, Fla., to Huntsville, Ala.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	984
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Typhoid fever	3
Malaria	1
Malarial fever	17
Remittent fever	2
Acute diarrhea	6
Other diseases	33

Total	62
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Admissions:

Remaining from last month	10
From command	52

Total to be accounted for	62
Completed cases	33

Returned to duty	7
Transferred to other hospitals	26
Otherwise disposed of	1

Total	34
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Remaining on sick report:

In hospital	4
In quarters	24
Total	28

This report is signed by Major Thompson, who states:

Regiment ordered to Philadelphia to be mustered out on September 8, 1898.

Again it will be seen that the figures in these reports do not tally. It should be understood that this report covers a period of only eight days.

We find in the records of this regiment 72 cases of

probable typhoid fever. These 72 cases were diagnosed as follows:

Typhoid fever.....	13
Malaria.....	43
Diarrhea.....	16
Total.....	72

They were distributed among the companies as follows:

Staff.....	1	Company G.....	9
Company A.....	5	Company H.....	7
Company B.....	9	Company I.....	2
Company C.....	10	Company K.....	2
Company D.....	7	Total.....	72
Company E.....	14		
Company F.....	6		

The following is a list of the deaths reported from this regiment. It will be seen that out of the 12 deaths here reported 10 were due to typhoid fever. This gives a death rate, figured on 72 probable cases, of nearly 14 per cent. There can be but little doubt that the actual number of cases of typhoid fever in this regiment was much greater than that given in our list of probable cases.

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bair, Samuel H.....	Pvt., E.	1898, Aug. 20	Fernandina, Fla.....	Typhoid.
Eger, Alfred.....	Pvt., D.	Sept. 11	Methodist Hospital, Philadelphia.	Do.
Evans, Howard.....	Pvt., D.	Oct. 26	Not given.....	Taken with spasm October 24. Typhoid.
Humphrey, Edward.....	Pvt., I.	July 16	Huntsville, Ala.....	Do.
McCullough, Frank C.....	Pvt., K.	Sept. 20	Philadelphia, Pa.....	Do.
Maginniss, Louis.....	Band.	Aug. 8	Fort McPherson, Ga.....	Do.
Moon, Samuel V.....	Corpl., C.	Sept. 11	Philadelphia, Pa.....	Do.
Morris, Abraham V.....	Pvt., E.	July 18	Port Tampa, Fla.....	Do.
O'Donnell, Daniel.....	Pvt., G.	Sept. 25	Not given.....	Do.
Roberts, Thomas.....	Pvt., C.	Sept. 3	Jefferson Hospital, Philadelphia.	Do.
Simpson, Harry I.....	Pvt., E.	Sept. 29	Philadelphia, Pa.....	Complications of diseases. Typhoid.
Smerer, Gottlieb F.....	Pvt., E.	June 1	Chickamauga, Ga.....	Typhoid.

COMMUNICATIONS FROM THE SURGEONS OF THE THIRD PENNSYLVANIA VOLUNTEER INFANTRY.

Medical officers:

Archibald G. Thompson, major and surgeon, Philadelphia, Pa.
 Francis D. Patterson, lieutenant and assistant surgeon, Philadelphia, Pa.
 Joseph W. Bauman, lieutenant and assistant surgeon, Lansdale, Pa.

Lieutenant Bauman states:

Our first camp was at Chickamauga, where we remained for a period of about twenty-one days. This site was a splendid one, but our water supply was miserable. The supply from the artesian wells seemed to be good in quality but was not sufficient in quantity. We obtained the greater part of our water from Chickamauga Creek, and this was greatly contaminated. During our stay at Chickamauga we lost one man with typhoid fever.

While at Port Tampa we were about 1,500 yards from the shore of Tampa Bay. As long as the dry season continued we had no cases of typhoid fever. Two weeks after the opening of the rainy season we moved to the other side of the railroad, half a mile distant from the first camp. This location was low, marshy, and

not capable of being drained. Sinks had to be dug two or three times a day, because we were not able to get to a sufficient depth before striking water. The latter part of our stay at this place we could not dig sinks more than 4 inches deep. We attempted to police the sinks from four to six times a day, but the excreta would always be on top of the water and attracted flies by the millions. The best thing we could do was to throw large quantities of paper and combustible material into the sinks and burn them. This method, while disinfecting the sinks, would cause a horrible odor to rise over the entire camp. While at Port Tampa we had several cases of typhoid fever. The water supply was taken from pipes which were connected with a well that supplied the railroad tank. This water was of fair quality, but contained large quantities of iron. The general sanitary condition of this camp outside of the sinks was fair, when taking into consideration the fact that the men were compelled to sleep on the ground, which was thoroughly saturated with water.

The site at Fernandina was a most excellent one. Here sinks could be dug to a depth of 6 or 8 feet without striking water. They were always kept in good condition, and there was plenty of dry earth for covering. The water supply was excellent, and after becoming used to the sulphur taste there was no objection to drinking it. However, it was at Fernandina that most of our cases of typhoid fever developed. I think that most of the men developing typhoid fever at Fernandina were infected at Tampa.

In my opinion flies were largely responsible for the distribution of typhoid fever. It is true that the men were very injudicious in eating all kinds of fruit, good, bad, and indifferent; the food supply of our own was not always of the best; the cooks were men detailed for that purpose, and had had no experience in the art. All these things doubtlessly tended to render the men susceptible to infectious diseases.

Major Thompson states:

As to the probable number of cases of typhoid fever in this regiment being given at too low a figure, I think that this is true for the following reasons:

When the regiment was ordered to Huntsville from Fernandina we met the hospital train from Philadelphia an hour or so out from Fernandina. I was instructed by the officer in charge of the train to put off as many men as I thought necessary to be taken to Philadelphia, in spite of the fact that these men had no furloughs and descriptive lists had not been made. I put off at the next station some twenty men, who were picked up by the hospital train about two hours later and taken to Philadelphia. Of the total deaths that occurred in this regiment six belonged to this group. I have no doubt that most of those transferred to the hospital train as above stated were suffering from typhoid fever. The majority of cases of typhoid fever in this regiment began to develop during the last few days of our stay at Fernandina.

I was present with the regiment at Port Tampa City, Fernandina, and Huntsville. The location at Port Tampa City was bad. The ground was exceedingly low, so that during the last two weeks or ten days of our stay there, owing to the heavy rains, it was practically a swamp. The sinks could be dug to a depth of only 12 inches before striking water. This necessitated digging new sinks each day. All the water drunk in this camp was both boiled and filtered. This rule was strictly enforced. Moreover, all sutlers' shacks were closed.

The location at Fernandina was good. The water supply was obtained from an artesian well, and was excellent. Since most of the typhoid fever occurring in this regiment developed during the last few days of our stay at Fernandina I think that the disease was due to drinking from surface wells.

The location and the water supply at Huntsville were excellent, and I think that our sickness at that place was due to infection contracted in previous camps.

ONE HUNDRED AND FIFTY-SEVENTH INDIANA VOLUNTEER INFANTRY.

This regiment assembled at Indianapolis, Ind., and was mustered into the service of the United States about May 10, 1898. It left Indianapolis May 15 and went to Chickamauga Park, Ga. It remained at this place only a few days and arrived at Port Tampa City, Fla., June 1, 1898.

According to the testimony of Major Barnett, this regiment reached Chickamauga without any sickness whatsoever. While at Chickamauga, the drinking-water supply was obtained from two sources. In part it was obtained from a driven well located between the camp of this regiment and that of the Second Wisconsin. The amount of water obtained from this source was altogether inadequate to supply these two regiments. The One hundred and fifty-seventh Indiana then obtained water from Cloud Spring. The water was brought from this spring in headless barrels, as was the custom at Chickamauga, and these barrels were distributed to the different companies in the camp. Major Barnett stated that the only sickness that occurred in this regiment while at Chickamauga was 1 case of pneumonia, 1 of septicemia, and 2 of sun-stroke. A study of the regimental reports shows no case which could have been typhoid fever until after the regiment reached Port Tampa City, Fla. In regard to this camp Major Barnett made the following statement:

Our camp when we first arrived at Port Tampa City was a moderately good one from a hygienic standpoint. However, we could dig our sinks not more than 4 feet deep. They were located in soft, sandy soil, and when carried to a greater depth filled with water. However, we were at this place for only about ten days when the rains began, and the water soon filled the sinks and rendered the digging of others well nigh impossible. In fact the water stood in our company streets and in the ditches about our tents. As soon as we arrived at Port Tampa City, I had an order issued compelling every individual to cover his stool as soon as it was deposited. Guards were placed at the sinks in order to see that this order was carried into effect. These guards were also instructed to arrest any man defecating on the ground. I think that if all the other regiments had been equally careful, our subsequent lot would not have been so bad. However, the First Ohio Volunteer Infantry was very indiscreet.

There was an old ditch leading from one of the low places to the bay; they placed a pole across this ditch and used it as a sink. They did not cover the contents of this ditch. I protested and got an order from General Hall and assisted in closing it. At first this was a dry ditch, but ten days after we reached the camp it was full of water and the contents floated back into our camp. The sinks in my own regiment after the rainy season were built above the surface. Dykes were constructed around them. The fecal matter deposited within these inclosures was covered with dirt once a day. Later we moved the camp to the east of the railroad to higher grounds. However, the elevation at this place was not more than 3 or 4 feet above the sea. The earth here was comparatively dry to a depth of about 2 feet. Here we dug our sinks about a foot deep and then threw up an embankment on each side of the sink. The rains fell in torrents and there was a time when there was not a dry spot in any of the tents in the regiment. After this there never was a time when one could not dig into the sand

with his heel to a sufficient depth to strike water. All the men had hammocks and by the means of these managed to keep out of the water while asleep. The first wetting we had was the bluest experience I ever met with; rain came at 9 o'clock at night and I had men standing half knee deep in water holding the sick up out of the water. There was not a dry stitch of clothing in the camp. We covered the sinks with ponchos. Before the men drew hammocks they cut the leaves of the palmetto, put their ponchos on these and then their blankets on top. This did very well until heavier rains set in. We had 1 case of possible typhoid fever while at Tampa. Indeed I am not sure that there has been a case of typhoid fever in my regiment up to the present time (August 27, 1898). I have had some cases with typhoid-fever symptoms, which I have treated with creosote, small doses of bicarbonate of soda, and calomel. I had 1 fatal case from hemorrhage of the bowels. No autopsy was made in this case. I have had up to the present time 11 deaths. Most of these have been due to malarial fever. I have had 5 deaths from uremic intoxication. All of these had prolonged diarrhea with fever followed by great exhaustion. Two patients have been sent from my regiment to the general hospitals and about 20 have been sent away on hospital trains. One died en route to Fort Thomas, Ky., and another died after reaching that place. All of these have, in my opinion, been cases of malaria. I have to-day 6 patients in the regimental hospital, 32 sick in quarters, and the number reported at sick call was 230. Most of these at sick call were returned to light duty. I think that typhoid fever has played a very small part in the sickness of the One hundred and fifty-seventh Indiana.

When asked if he believed that the same was true of other regiments about him, Major Barnett made the following reply:

I do not. At Chickamauga Park the first thing I did was to take the men out, a battalion at a time, and give them a lecture as to the care of themselves, their diet, buying and eating fruit, lemonade and ice cream, and being careful as to the water they drank, and telling them that they should not drink anything but water, and that all of this should be boiled. These lectures did not prevent many men from doing what I condemned, but many of them paid attention. The majority did as I advised. On account of the bad water at Chickamauga I advised putting in a canteen, and after this was done our sick report ran down 60 per cent the first forty-eight hours and stayed down all the time while we were there; but we did not continue the canteen after we reached Tampa, Fla. I objected to it at Tampa and asked the colonel to issue an order forbidding the use of alcoholic drinks, liquors, uncooked fruits of any kind, pies, and cakes. While a few of the men did not comply with these recommendations, a majority of them obeyed orders, and for that reason I think we have had a better condition of digestion than those who have been buying and eating so much at shacks and canteens. Fifty per cent of those who have died in my regiment were men accustomed to take alcohol.

We have quoted extensively from the testimony of Major Barnett in order to show how tenaciously some of the regimental surgeons held to the opinion that there was no typhoid fever among the troops. Directly after the interview from which the above has been abstracted we inspected this regiment and found numerous cases of undoubted typhoid fever, not only in the regimental hospital, but also sick in quarters, lying in the crowded tents in a most uncomfortable condition.

So far as we can ascertain from the records, the first case of probable typhoid fever in this regiment had its

initial date June 10. There were 7 cases during June. During July the disease slowly spread and acquired epidemic proportions toward the last of this month. In all, we find 219 cases of probable typhoid fever. Of these, 112 were sent to the State hospital at Indianapolis, Ind. These 219 cases were diagnosed as follows:

Typhoid fever.....	2
Malaria.....	170
Diarrhea.....	47
Total.....	219

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Archer, Fred	Pvt., G.	1898. Aug. 15		
Beaber, William J.	Pvt., G.	Aug. 27	Fernandina, Fla.	Blood poi- son.
Boomershine, James .	Pvt., C.	Aug. 24		Peritonitis.
Butler, George P.	Pvt., G.	July 31	Fort Thomas, Ky.	Typhoid.
Darling, Robert	Corpl., E.	Sept. 2	Indianapolis, Ind.	(Typhoid); malaria.
Hauptert, Christian P.	Pvt., D.	Aug. 27	Fernandina, Fla.	Typhoid.
Herring, Harry W.	Pvt., F.	Oct. 17	Indianapolis, Ind.	Congestive chill.
Jones, Arthur	Sgt., E.	Aug. 19	Fernandina, Fla.	(Typhoid); malaria.
Kenney, Frederick E.	Pvt., B.	Aug. 15	.....do.....	Do.
Krutzer, William.....	Pvt., F.	Aug. 30		Typhoid.
Lovell, Clifton M.	Pvt., B.	Aug. 30	Fernandina, Fla.	(Typhoid); intestinal hemor- rhage.
Luse, Warren S.	Pvt., H.	Sept. 3	Angola, Ind.	Typhoid.
Overle, Macy	Pvt., D.	July 29	On hospital train com- ing from Tampa.	(Typhoid); exhaustion due to ma- laria.
Perkins, Harry O.	Pvt., F.	Aug. 20	Fernandina, Fla.	Typhoid.
Perry, Charles E.	Pvt., C.	Aug. 22	On train	Do.
Simmons, Charles	Pvt., C.	Sept. 19	State field hospital, Camp Mount, Ind.	Do.
Slade, Charles.....	1st. lt.	July 20	Port Tampa, Fla.	(Typhoid); bilious fe- ver.
Snyder William A.	Pvt., B.	Aug. 29	Fernandina, Fla.	(Typhoid); gall stones and mala- ria.

Total deaths	18
Deaths due to typhoid fever	14
Percentage of deaths among probable cases of typhoid fever (219), 6.39.	
Percentage of deaths among recognized cases of typhoid fever (2), 700.	

It is highly probable that the first three individuals in the above list died from typhoid fever. Of the third on the list, Major Barnett spoke to us while at Fernandina; he insisted that this was a case of malaria. This was one of the very few cases sent by Major Barnett to the division hospital. Major Barnett diagnosed the case as one of malaria. The diagnosis of peritonitis was given at the hospital.

It should be stated that in his testimony before our board at Fernandina Major Barnett stated that there might possibly have been 5 cases of typhoid fever in his regiment. We have no hospital check on the regimental diagnosis, inasmuch as very few patients were sent to division or reserve hospitals. In fact the diagnosis of typhoid fever does not occur in the regimental report at all. The two cases diagnosed as typhoid fever were as follows:

No. 1. George P. Butler, received at Fort Thomas, Ky., July 29; died July 31. The date of original admission to sick report in this case is given in the Fort Thomas records as July 19. It is worthy of notice that this man died two days after he reached Fort Thomas, and after the long ride from Tampa, Fla., to Fort Thomas, Ky.

No. 2. C. P. Hauptert, died in division hospital at Fernandina, August 27, on the third day after reaching this hospital.

Furthermore, attention should be called to the fact that Overle and Perry died on trains. In our opinion there can be no doubt that the death rate from typhoid fever among troops during the summer of 1898 was markedly increased by the transportation of very sick men. In the early stages of the disease and with properly equipped hospital trains transportation of men sick with typhoid fever is probably not harmful, but in the later stages of the disease transportation becomes decidedly dangerous. Moreover, sick men were not always transported on hospital trains. If our information be correct, Perry died on an ordinary train.

THIRTY-SECOND MICHIGAN VOLUNTEER INFANTRY.

This regiment assembled at Camp Eaton, Island Lake, Mich., about April 26, 1898. It remained at this place until May 19, on which date it departed for Tampa, Fla., arriving May 22, 1898. At Tampa this regiment was encamped at Palmetto Beach and did not change its site during its stay at Tampa. Water was obtained from the Guerra, Diaz & Co. well, also from shallow wells located at houses in the vicinity of the camp. From the testimony of Captain Burkhardt, this regiment reached Tampa without any illness at all, but diarrhea began to develop in about ten days.

When asked about the sinks in his regiment at Tampa, Captain Burkhardt made the following statement:

When we first arrived at Tampa we were able to dig the sinks about 3 feet deep before striking water, but after it began to rain and during the last few weeks of our stay we could not dig 6 inches into the ground without striking water. There was an order to throw dirt into the sinks. In the first place we could not dig and in the second place we had no dirt to throw into them. The sinks overflowed, but the fecal matter was carried in the opposite direction from the regimental camp. The space between the sinks and the bay was covered with fecal matter. Flies swarmed over these deposits, not more than 50 yards from the kitchens and mess tents. Lime was procured in large amount and the ground kept white with this substance. During the latter ten days of our stay at Tampa no words can describe the condition; it was the most terrible I ever saw.

CONDENSED SICK REPORT FROM MAY 22 TO 31.

Mean strength	1,013
Diarrhea.....	2
Malaria.....	2
Other diseases.....	17
Total.....	21

Of the 2 cases of malaria here recorded, 1 was off duty for three days and the other for only one day.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,015
Diarrhea	22
Other diseases	56
Total	78

None of the cases of diarrhea here reported were off duty more than six days, and most of them for only two days.

Captain Burkhardt states:

No serious case of any acute disease, other than 1 of pneumonia, now convalescent, has been reported.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,239
Diarrhea	238
Malaria	97
Typhoid fever	1
Other diseases	41
Total	377

We have not been able to obtain any sick reports of the Thirty-second Michigan since that for July. Although only 1 case of typhoid fever is recorded in the above-given sick reports, Captain Burkhardt in his testimony before our board stated that he had 2 cases of typhoid fever at Tampa. He was unable to give us the exact dates when these men were taken ill and we fail to find any record of them on the regimental report.

Captain Burkhardt stated that these men were taken ill about three weeks before the regiment left Tampa, and that 1 of them was transferred to the general hospital at Fort McPherson. In the records of Fort McPherson Hospital we find that this man was received at the hospital July 15, and the date of his original entry is given as July 5. In this way we have been able to place 1 of the cases of typhoid fever developed at Tampa, Fla. In the records of the general hospital at Fort Thomas, Ky., we find that a case of typhoid fever was received by hospital train from the Thirty-second Michigan at Tampa, Fla., July 28; the date of original entry in this case is not given. The man undoubtedly was sick for some weeks in the regimental hospital at Tampa. Captain Burkhardt stated that the stools of men sick with typhoid fever were immediately disinfected with chloride of lime and then buried. Undoubtedly, however, these men visited the sinks during the first part of their illness and deposited fecal matter infected with typhoid fever in these receptacles. In fact, Captain Burkhardt stated that one of these men had a case of walking typhoid fever, and in the doctor's opinion the man had been sick about two weeks before his condition was discovered and he was sent to the hospital.

This regiment left Tampa for Fernandina, Fla., July 26, 1898. Two or three suspicious cases developed during the journey from Tampa to Fernandina, and immediately after arriving at Fernandina typhoid fever became epidemic in this regiment.

This regiment remained at Fernandina until September 1, 1898, when it went to Huntsville, Ala. It remained at Huntsville only a few days, when it returned to Michigan and was disbanded.

We find in the regimental and hospital records 253 probable cases of typhoid fever from this regiment. A regimental hospital was maintained and patients were not sent to division hospital. Occasionally when a man became very ill he was sent to some general hospital or to his home. Twenty-six cases were sent to Fort McPherson and were recognized as typhoid; 60 additional cases went to the same hospital under the diagnosis of malaria; 8 cases, which proved to be typhoid fever, were sent to Fort Thomas, Ky., and 9 additional cases, diagnosed as malaria, were sent to the same hospital.

SUMMARY.

Assembled at Camp Eaton, Island Lake, Mich., April 26, 1898.	
Mustered into United States service about May 10, 1898.	
Arrived at Tampa, Fla., May 22, 1898.	
Strength on arrival, 1,013.	
Date of first case of probable typhoid fever, July 5, 1898.	
Date of first case of recognized typhoid fever, July 5, 1898.	
Left Tampa, Fla., July 26, 1898.	
Number of cases of probable typhoid fever developed at Tampa, Fla.	2
Arrived at Fernandina, Fla., about July 28, 1898.	
Left Fernandina, Fla., about September 1, 1898.	
Arrived at Huntsville, Ala., about September 2, 1898.	
Left Huntsville, Ala., about September 12, 1898.	
Number of cases of probable typhoid fever developed after leaving Tampa, Fla.	251
Total number of cases of probable typhoid fever developed in the Thirty-second Michigan Volunteer Infantry from May to September, 1898.	253
These 253 cases of probable typhoid fever were diagnosed as follows:	
Typhoid fever	34
Malaria	175
Diarrhea	44
Total	253
These cases were distributed among the companies as follows:	
Company A	25
Company B	27
Company C	13
Company D	27
Company E	24
Company F	31
Company G	19
Company H	21
Company I	10
Company K	15
Company L	24
Company M	18
Total	253

The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Adams, Harry F.....	Pvt., E.	Aug. 8	Fernandina, Fla.....	Typhoid.
Bacon, Gilbert H.....	Pvt., E.	Aug. 21	Fort McPherson, Ga.....	Do.
Brandon, George T.....	Pvt., I.	Sept. 15	Huntsville, Ala.....	Do.
Botsford, Seba H.....	Pvt., F.	Sept. 23	Detroit, Mich.....	Do.
Carr, Frederick M.....	Pvt., F.	Aug. 31	Fort McPherson, Ga.....	Do.
Etzcorn, Carroll N.....	Mus., B.	Sept. 5	Fernandina, Fla.....	Cerebrospinal meningitis.
Fuller, Leslie C.....	Pvt., B.	Oct. 8	Corps reserve hospital, Camp Wheeler, Huntsville, Ala.	Typhoid.
Gatt, Clarence A.....	Corpl., B.	Oct. 8	Grand Rapids, Mich.	Do.
Hinchey, James.....	Pvt., M.	Aug. 12	Fort McPherson, Ga.....	Do.
King, Charles H.....	Pvt., M.	Oct. 13	Milan, Mich.....	(Typhoid); dysentery.
Lardie, George.....	Pvt., L.	Sept. 7	Fernandina, Fla.....	Typhoid malarial.
Magee, Walter M.....	Pvt., K.	Aug. 27	.....do.....	(Typhoid); malaria.
Mouncey, Alexander M.	Pvt., M.	Oct. 9	Detroit, Mich.....	Typhoid.
North, Roy B.....	Pvt., D.	Oct. 16	Battle Creek, Mich.....	Do.
O'Brien, Edward J....	Pvt., C.	1899. Jan. 1	Fort McPherson, Ga.....	Do.
1898.				
Porter, Harry L.....	Pvt., C.	Sept. 5	.....do.....	Do.
Rolph, Benjamin E.....	Pvt., A.	Aug. 4	Fernandina, Fla.....	Do.
Shields, Edward A.....	Sgt., C.	Sept. 16	.....do.....	Do.
Stevens, Don H.....	Pvt., D.	Oct. 1	Battle Creek, Mich.....	Do.
Stockwell, Samuel.....	Pvt., M.	Aug. 17	.....do.....	Do.

Total deaths.....	20
Deaths due to typhoid fever.....	19
Percentage of deaths among probable cases of typhoid fever (253), 7.50.	
Percentage of deaths among recognized cases of typhoid fever (34), 55.88.	

It seems from the history of this regiment that in all probability it reached Tampa without being infected with typhoid fever. It was not until six weeks after reaching Tampa that a case of typhoid fever developed. After this the regiment became seriously infected. It carried this infection with it to Fernandina, Fla., and then to Huntsville, Ala. The condition of the sinks of this regiment, both at Fernandina and Huntsville, was filthy in the extreme, and there can be but little doubt that flies acted as the principal agent for spreading the infection in this command at these two encampments. A statement concerning the condition in which we found the sinks may be seen by reference to the report of our board to the commanding general at Fernandina.

COMMUNICATIONS FROM THE SURGEONS OF THE THIRTY-SECOND MICHIGAN VOLUNTEER INFANTRY.

Medical officers.

Lawrence K. Knowles, major and surgeon, Three Rivers, Mich.
John L. Burkart, captain and assistant surgeon, Grand Rapids, Mich.
O. D. Weed, lieutenant and assistant surgeon, Detroit, Mich.

Lieutenant Weed states:

Our Tampa camp was situated on the shore of Hillsboro Bay, and was but little above high-water level. The source of our water supply was an artesian well on Tampa Heights. This well was some 325 feet deep, and the water was conveyed through surface pipes to the camp. This water was believed to be good. Sinks were placed at the foot of each company street, and as far from the mess tents as possible in the direction of the bay. They were dug to a depth of about 5 feet, and the contents were covered

twice a day. The closet (a regimental one) was situated rather close to camp, but could not well have been placed elsewhere, on account of the proximity of other regiments. During the dry season this camp was kept in fair sanitary condition, but when the rainy season opened sinks could not be dug at all. Garbage and refuse were deposited as near the bay and as far from camp as possible, and here it remained during our stay there. At one time the entire camp was submerged, and putrid matter of all sorts floated through the streets of the camp. After this the stench was nauseating.

The camp at Fernandina, Fla., was situated on high ground. The air was pure and wholesome; the water from an artesian well, and of excellent quality. Sinks were deep, and the contents were covered twice a day. Although many cases of typhoid fever developed at Fernandina, I think that the majority of these men were infected at Tampa.

Our camp at Huntsville, Ala., was most desirably situated. The soil was well drained and suitable for the digging of sinks. The water was excellent.

Captain Burkhardt makes the following statement:

The sanitary conditions of the camp at Palmetto Beach, Tampa, Fla., from May 23, 1898, to July 1, 1898, were very good; the water supply was from a deep well on the property of Guerra, Diaz & Co., and was carefully policed; the closets were kept in a sanitary condition with fresh earth; the camp was guarded against the sale of questionable drinks, ices, pies, etc., and our sick report demonstrates our condition during this time, as only 2 cases of typhoid fever are noted from May to July 1, 1898, and 1 of the 2 I know was contracted out of camp at a division hospital, and developed about one week after the advent of the soldier to our regiment, and only 66 men were excused from duty during all this time. With the advent of the rain in July the possibility of securing dry earth and deep closets could not be considered, and consequently we suffered. Our requests for change of location were unheeded, and we paid the penalty of the error of some one else. Nevertheless our regiment did not have over 35 cases of typhoid fever recorded during our entire service. We had never less than 1,026 men reported for duty but once, when the number dropped to 986; this includes details and sick men.

Fernandina, Fla., was a very agreeable change, and the soil was admirably fitted for camping purposes; water was good; soil admitted deep closets, and the dry earth was easily obtained. Our camp was carefully guarded and nothing of a questionable character permitted on the ground. Notwithstanding all precautions our sickness increased, but it is not to be wondered at—the seeds of the disease had been planted while we were in Tampa, Fla. Huntsville, Ala., was a preoccupied camp and was left in a filthy condition by the regiment preceding us. The water supply was excellent, closets were well cared for, etc., still typhoid appeared, but it came with us, I think. Island Lake played havoc with us, as the change was so very marked, and numerous cases of jaundice appeared.

Major Knowles, who was detailed as brigade surgeon, and consequently removed from his regiment while at Tampa and Fernandina, makes the following statement:

I found on my return to the regiment an epidemic of typhoid fever, and it is my opinion that 98 per cent of the cases of fever that occurred in my regiment after my return were typhoids.

SECOND GEORGIA VOLUNTEER INFANTRY.

This regiment assembled at Griffin, Ga., in April and May, 1898. It was mustered into the service of the United States May 14, 1898, and on May 20 left Griffin for Tampa, Fla., arriving at the latter place May 21, 1898.

CONDENSED SICK REPORT FROM MAY 16 TO 31, INCLUSIVE.

Mean strength	1,000
Diarrhea.....	8
Without diagnosis.....	12
Malaria.....	1
Dysentery	1
Other diseases.....	18
Total	40

This report is signed by Lieut. Charles C. Geer, assistant surgeon. Lieutenant Geer makes no comments.

When this regiment left Griffin, Ga., for Tampa, Fla., it did not carry a sick man with it. After reaching Tampa, it encamped at Palmetto Beach on a neck of land that runs out into the bay about $3\frac{1}{2}$ miles from the city of Tampa. The surface of this encampment is not more than 6 feet above the level of the sea. The ground occupied is covered with palmettoes in a grove of pine trees. Water was distributed through this camp by means of pipes brought from an artesian well located at a cigar factory. This well was generally known among troops encamped about Tampa in 1898 as the Guerra, Diaz & Co. well. Sinks were dug in the sand and gravel to a depth of about $5\frac{1}{2}$ or 6 feet. If dug deeper they filled with water. The sinks were placed about 120 feet distant from the mess tents. Later they were moved farther back, but in doing so they were crowded too much toward the camp of the First Florida Volunteer Infantry. Until the rainy weather came on the regiment got along very well in this place. After the rains began to fall the sinks commenced to fill up with water, and as the rainfall became greater they overflowed, and other sinks could not be dug, because the ground was filled with water.

In his testimony before our board Lieutenant Geer stated with reference to this matter as follows:

The First Battalion was on higher ground than the other two. I do not think that the First Battalion sinks overflowed. In the Second most of them overflowed, and in the Third Battalion the sinks overflowed and covered the ground for 50 or 60 feet about them.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,007
Typhoid fever	1
Malaria.....	9
Undetermined fever.....	1
Diarrhea.....	5
Dysentery	11
Indigestion	1
Other diseases.....	62
Total	90

The case of recognized typhoid fever was that of a private in Company L, who was taken sick June 8 and sent to division hospital June 15. The case of undetermined fever also proved to be typhoid. However, in all probability these were not the first cases of typhoid fever in this regiment.

As has been stated, this regiment left Griffin, Ga.,

without any sick, but before it arrived at Tampa one man complained of being ill, and later he was sent to hospital, and his disease proved to be typhoid fever. In the May report this case is 1 of the 12 without diagnosis. As many as 14 other cases, which subsequently proved to be typhoid fever, developed in this regiment before May 31. It will therefore be seen that while the Second Georgia left its State encampment without a sick man it did have a considerable number already infected with typhoid fever.

CONDENSED SICK REPORT FOR JULY.

Mean strength about.....	1,100
Typhoid fever.....	2
Malaria.....	23
Diarrhea.....	13
Undetermined fever.....	5
Dysentery	7
Indigestion	5
Other diseases.....	86
Total	141

During the month of June only 11 cases of typhoid fever developed. About the 1st of July cases began to appear more frequently. However, all through this month and even during August there appeared new cases in groups. For instance, on the 1st and 2d of July there were 6 new cases. On the 3d and 4th no cases were reported. From the 5th to the 7th, inclusive, 4 new cases developed. From the 8th to the 12th, inclusive, no new cases were reported. From the 13th to the 16th, inclusive, 10 new cases developed. From the 17th to the 20th no new cases were reported. However, the fact that these cases were grouped may be easily seen by reference to the chart showing the prevalence of typhoid fever in this regiment. Some time in July (we have not been able to ascertain the exact date) this regiment was transferred from Palmetto Beach to Tampa Heights. Although the location at the latter place was somewhat better than that of the former, there was no abatement in total sickness or in the cases of typhoid fever.

In the August report Lieutenant Geer, acting surgeon, makes the following statement:

This command was encamped at Tampa Heights until August 19, when it moved to Camp Wheeler, Huntsville, Ala., arriving August 21. While encamped at Tampa Heights typhoid fever was on the increase constantly. Other diseases were also prevalent, such as malaria, diarrhea, and dysentery. It is my opinion that the diarrheas and dysenteries were largely malarial, and this opinion is borne out by the fact that in most cases quinine proved beneficial in their treatment. We have also had an epidemic of measles, but this has been of mild type, and we have not lost a man in the three and one-half months of this disease, directly or indirectly. The fact that both camp sites in Florida were on low grounds, which were flooded by the frequent rains, accounts for the diseases of malarial origin. The cause of the typhoid fever can not be definitely stated, but I believe that it is due to the fact that the second camp occupied by us at Tampa had been previously occupied by regular regiments infected with typhoid fever. In our camp at Palmetto Beach we had artesian water, and while on

Tampa Heights we were supplied from the city waterworks. I have seen no report of an analysis or examination of either of these waters and have had no means of ascertaining their character.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,046
Typhoid fever	8
Malaria	49
Diarrhea	3
Dysentery	6
Undetermined fever	9
Indigestion	2
Other diseases	67
Total	144

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,040
Typhoid fever	2
Malaria	87
Undetermined fever	21
Diarrhea	26
Indigestion	28
Dysentery	8
Gastritis	2
Other diseases	126
Total	300

It will be seen that although this regiment left Tampa August 19 and went to Camp Wheeler, Huntsville, Ala., which is regarded as a most healthful location, and where they had an abundant supply of pure water, new cases of typhoid fever continued to appear with no less frequency during the following six weeks. Attention is called to the large number of cases diagnosed as malaria and undetermined fever in the September report.

This regiment was furloughed October 5, 1898, and at the expiration of this furlough was mustered out of the service.

SUMMARY.

Assembled at Griffin, Ga., in May, 1898.	
Mustered into the service of the United States May 14, 1898.	
Arrived at Tampa, Fla., May 21, 1898.	
Strength on arrival, 1,000.	
Date of first case of probable typhoid fever, May 20, 1898.	
Date of first case of recognized typhoid fever, June 8, 1898.	
Left Tampa, Fla., August 19, 1898.	
Number of cases of probable typhoid fever developed at Tampa, Fla.	87
Arrived at Huntsville, Ala., August 21, 1898.	
Number of cases of probable typhoid fever developed after leaving Tampa	97
Total number of cases of probable typhoid fever developed in the Second Georgia Volunteer Infantry from May to September, 1898	184
These 184 cases were diagnosed as follows:	
Typhoid fever	47
Undetermined fever	19
Malaria	97
Indigestion	14
Diarrhea	4
Dysentery	3
Total	184

The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Barrett, Lank T.	Pvt., H.	July 18	Fort McPherson, Ga.	Typhoid.
Brown, Barnamus H.	Pvt., L.	Sept. 18	Huntsville, Ala.	Do.
Hubbard, W. J.	Pvt., F.	Sept. 24	do	Do.
Johnson, Alexander.	Pvt., K.	Sept. 15	do	Tuberculosis.
Lee, Walter G.	Mus., L.	July 25	Fort Thomas, Ky.	Typhoid.
May, James T., jr.	Corpl., L.	Aug. 3	do	Do.
Moseley, John T.	Pvt., L.	Aug. 17	Tampa, Fla.	Typhoid and peritonitis.
Pace, Anderson M.	Pvt., B.	Aug. 29	Huntsville, Ala.	Typhoid.
Page, Malcus B.	Pvt., L.	July 29	Fort McPherson, Ga.	Do.
Phillips, Joseph O.	Pvt., L.	Aug. 1	Fort Thomas, Ky.	Do.
Taylor, Harry H.	Pvt., M.	Sept. 3	Fort Monroe, Va.	Do.
Walsh, John M.	Pvt., E.	Nov. 11	Augusta, Ga.	Do.
Walton, William F.	Pvt., C.	Sept. 18	Huntsville, Ala.	Do.
Winter, John G.	Pvt., C.	Oct. 22	Greens Cut, Ga.	Do.

Total deaths 14

Deaths due to typhoid fever 13

Percentage of deaths among probable cases of typhoid fever (184), 7.06.

Percentage of deaths among recognized cases of typhoid fever (47), 27.65.

We are quite thoroughly convinced that the number 184 is not sufficiently large to indicate the actual number of cases of typhoid fever in this regiment. However, it embraces all that we have been able to find in the reports.

COMMUNICATIONS FROM THE SURGEONS OF THE SECOND GEORGIA VOLUNTEER INFANTRY.

Medical officers.

Edward C. Davis, major and surgeon, Atlanta, Ga.

Charles C. Geer, lieutenant and assistant surgeon, Atlanta, Ga.

William H. Moncrief, lieutenant and assistant surgeon, Atlanta, Ga.

Major Davis states:

The water obtained from the artesian well of Guerra, Diaz & Co. appeared to be good, but there were near-by wells containing water which, in spite of positive orders, the men would drink. In order to suppress this, the commanding officer placed guards over these wells, and on my recommendation closed all the stands selling the abominable "soft drinks." These stands used the water from the shallow wells to prepare their drinks, and for this and other sanitary reasons I recommended that they be closed.

To the use of this water and the sinks I attribute many of the cases of typhoid fever. The camp site at Palmetto Beach was a pretty camp for a small number of men for a limited period during the dry season, but not for a large number of men and not for a longer period than three or four weeks and not during the rainy season. A prompt removal from this site was urged by me as soon as the rainy season was ushered in. This resulted in removal to a site which was an apparent rather than a real improvement, for in the rear of the camp and near the road was a stagnant pond which could not be entirely drained, and in addition to this a regular regiment had previously encamped there and had suffered from typhoid fever, as was subsequently learned. The colonel of the Second Georgia endeavored earnestly to secure a site where no troops had been encamped, but was informed that such a place as he wished could not be supplied with water in sufficient quantity. As to the care of sinks at Palmetto Beach, it must be said that they were dug about 6 feet deep, deeper when the soil would permit. The contents were covered twice daily with dirt thrown in by details from each company. When the contents reached to within 2 feet of the surface they were ordered filled and new sinks dug. The flies were present in great numbers, and it was well-nigh impossible to keep them from the food.

I would like to call your attention to the great mortality in Com-

pany L. It will be seen that this company lost 6 men. This company was as favorably located as any in the regiment. The captain was very careful about the drinking water, and under the personal supervision of First Assistant Surgeon Geer he scalded his drinking vessels daily. The cooking, however, was constantly bad. The men of Company L were almost entirely country boys.

FIFTH OHIO VOLUNTEER INFANTRY.

This regiment assembled at Columbus, Ohio, and was mustered into United States service May 11, 1898. It remained at Columbus until May 18, 1898, and on this date departed for Tampa, Fla., reaching the latter place May 21, 1898.

CONDENSED SICK REPORT FROM MAY 11 TO 31.

Mean strength.....	792
Typhoid fever.....	2
Other diseases.....	18
Total	20

It will be seen that two cases of typhoid fever appeared during this month, one of them on the day that the regiment reached Tampa and the second one May 30. No cases of diarrhea, dysentery, or malaria appear on this report. It is evident that this regiment became infected with typhoid fever before it left Columbus.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	756
Intermittent malaria.....	25
Other diseases.....	60
Total	85

Diarrhea, dysentery, and typhoid fever do not occur on this report, except that diarrhea is given as a complication of acute indigestion in 10 cases. There is no evidence from this report that there was any typhoid fever in this regiment during the month.

The surgeon makes the following statement:

One of the most prevalent troubles immediately after our arrival at Tampa was pharyngitis, for which I can not account except by supposing it to be due to the inhalation of the fine dust with which the wind is filled. Later there were cases of acute indigestion, accompanied or followed by cramps and diarrhea. However, none of these were serious; as a rule, the attacks lasted only a day or so and were accompanied by some fever. Severe cases of malaria have been notably absent.

CONDENSED SICK REPORT FOR JULY.

Mean strength.....	1,320
Diarrhea.....	24
Dysentery.....	1
Typhoid fever.....	3
Other diseases.....	166
Total	194

The diarrheas mentioned in this condensed sick report are recorded in the original as complications of acute indigestion. It is evident that the condition designated as "acute indigestion" in this regiment does not differ

from that usually designated as "acute diarrhea." There were undoubtedly many other cases of typhoid fever than those recognized as such sent to the hospital during the month of July. The following cases are illustrations:

No. 1. Company F: Intermittent malaria, July 8; transferred to Third Division Hospital July 14; still sick in hospital July 31.

No. 2. Company D: Intermittent malaria, July 11; sent to division hospital July 11; still sick in division hospital July 31.

No. 3. Company F: Malaria and acute indigestion, July 12; sent to division hospital July 13; still sick in division hospital July 31.

There are 20 other similar cases in the July report.

During the period covered by this report this regiment removed from Tampa to Fernandina, Fla. After arrival at Fernandina, Major Love, surgeon in charge, wrote the following:

Since removing to this camp the sick report has been very high, due in great measure to the condition of our previous camp at Tampa. The sanitary conditions of the present camp are good and very little sickness is anticipated.

The 3 recognized cases of typhoid fever in this report had their initial dates July 22, 25, and 30. Accepting the diagnoses recorded in the reports, it would appear that this regiment was free from typhoid fever from May until the latter part of July. However, a study of the cases diagnosed other than typhoid fever shows that this does not represent the facts and that typhoid fever continuously existed in this regiment.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength.....	1,337
Diarrhea.....	23
Intermittent fever.....	73
Dysentery.....	1
Typhoid fever.....	5
Undetermined fever.....	93
Malaria.....	127
Remittent fever.....	1
Other diseases.....	249
Total	572

While diarrhea occurs in this report 23 times as a primary disease, it occurs 108 times as a complication. It appears as a complication not only of acute indigestion but also of malaria and undetermined fevers. Among the undetermined and malarial fevers in this report at least 123 proved by their subsequent histories to be typhoid fever.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength.....	1,120
Malaria.....	162
Dysentery.....	2
Undetermined fever.....	70
Typhoid fever.....	79
Diarrhea.....	29
Other diseases.....	61
Total	403

This regiment was at Fernandina, Fla., and Cleveland, Ohio, during the period covered by this report, it having reached Cleveland September 12, 1898. The increase in cases of typhoid fever is marked. Forty-five of the cases of indigestion and 122 of the so-called malarial cases were sent to hospitals or to their homes.

There is a sick report for October, but it is incomplete and covers only the sick left in the hospitals at Cleveland. Indeed, it fails to account for many of these. However, there are in this report two points of interest. Twelve cases otherwise diagnosed in the preceding month are now recognized as typhoid fever. In the second place, 3 new cases of typhoid fever developed during the month of October. We say at least 3 cases, because as the regiment was disbanded on a furlough of thirty days on September 30, the regimental surgeon could not be expected to have any full knowledge of the diseases appearing among the furloughed men. Two of the new cases of typhoid fever first reported sick October 19. It will thus be seen that although the regiment reached Cleveland September 12, it continued to develop typhoid fever as late as October 19.

The history of this regiment may be briefly summarized as follows: It became infected at Columbus, Ohio. Whether this infection was brought from the homes of the men or whether it was introduced at the State encampment we have no means of determining. This command, infected with typhoid fever, went to Tampa. During June and July it evidently became widely and seriously infected. Whether this infection was spread by means of water or not we have been unable to determine, since we have not been able to secure any exact information concerning the water supply of this regiment. After becoming widely infected the regiment went to Fernandina, Fla., where the water supply was above suspicion, but undoubtedly typhoid fever continued to be disseminated by means of flies and by the infection of persons, clothing, blankets, tentage, etc. This infection remained with the men after they reached Cleveland and continued to manifest itself until late in October.

From the regimental and hospital records we have collected a list of 310 cases of prolonged fever in this command. These cases were diagnosed as follows:

Typhoid fever.....	88
Malaria.....	167
Diarrhea.....	55
Total	310

The following is a list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Adams, Wade E	Pvt., M.	Sept. 8	Fort Thomas, Ky.....	Typhoid.
Brady, Clinton J.....	Qm. sgt., B.	Aug. 15	Fernandina, Fla.....	Do.
Busch, Edward.....	Pvt., F.	Sept. 10	Fort Thomas, Ky.....	Do.
Dalzell, Clifton H.....	Pvt., H.	Aug. 7	Fernandina, Fla.....	Do.
Eichler, Alfred C.....	Corpl., C.	Oct. 16	Cleveland, Ohio.....	Typhoid malarial.
Forbes, Palmer E.....	Pvt., E.	July 20	Fort McPherson, Ga.....	Typhoid.
Hawk, Harry M.....	Pvt., F.	Sept. 8	Fernandina, Fla.....	Do.
Judd, Percy A.....	Pvt., E.	Nov. 6	United States Marine Hospital, Cleveland, Ohio.	Do.
Keenan, John H.....	Corpl., I.	Sept. 20	Lake Hospital, Cleveland, Ohio.	Cerebro-meningitis.
Kennedy, Daniel J.....	Pvt., H.	Oct. 4	Cleveland, Ohio.....	Typhoid.
Lawrence, Ralph E.....	Pvt., G.	Aug. 23	Fernandina, Fla.....	Do.
O'Donnell, Harry J.....	Corpl., F.	Oct. 13	Cleveland, Ohio.....	Typhoid pneumonia.
Oergel, Henry.....	Pvt., D.	Oct. 3	do.....	Typhoid.
Plimpton, Don N.....	Pvt., G.	Sept. 3	Fort McPherson, Ga.....	Do.
Potter, Burton J.....	Corpl., F.	Sept. 7	Cleveland, Ohio.....	Do.
Spigler, Geo. W.....	Sgt., H.	Oct. 24	do.....	Do.
Stein, Mathew E.....	Pvt., C.	Aug. 28	Division hospital.....	Do.
Walker, Barton J.....	Pvt., D.	Sept. 12	Fernandina, Fla.....	Cause not given.
Warner, Carl F.....	Pvt., C.	May 18	Columbus, Ohio.....	Spinal meningitis.
Weber, Harry F.....	Corpl., L.	Sept. 26	Cleveland, Ohio.....	Typhoid.
Wedlake, Christian.....	Pvt., D.	Sept. 23	do.....	Do.
Woolfe, Hiney G.....	Sgt., H.	Aug. 26	Fernandina, Fla.....	Do.

This gives a total of 22 deaths, 20 of which were due to typhoid fever. Figured on the basis of our list of 310 cases of prolonged fever, this gives a death rate of 6.45 per cent.

FIFTH UNITED STATES CAVALRY.

The first report that we have for this regiment, after it took the field, covers the period from May 15 to 31. During this time it was in camp near Mobile, Ala. The regiment consisted of headquarters, staff, band, and ten troops, also a detachment from the Hospital Corps. The report for this period is signed by Charles B. Ewing, captain and assistant surgeon, who makes no remarks.

CONDENSED SICK REPORT FROM MAY 15 TO 31.

Mean strength	517
Malarial fever.....	1
Acute diarrhea.....	6
Other diseases.....	16
Total	23
Remaining on sick report:	
In hospital.....	9
In quarters.....	13
Total	22

The June report is signed by W. B. Winn, assistant surgeon, without comment. This report is dated at Tampa, Fla. There is no record on the report of the time when the regiment was transferred from Mobile to Tampa.

CONDENSED SICK REPORT FOR JUNE.

Average strength	869
Remittent fever	6
Malarial fever	3
Dengue fever	3
Intermittent fever	2
Acute diarrhea	20
Chronic diarrhea	1
Dysentery	3
Other diseases	47
Total	85
Remaining on sick report:	
In hospital	1
In quarters	5
Total	6
Returned to duty	57
Died	1
Discharged for disability	2
Discharged at expiration of service	8
Deserted	1
Transferred to other hospitals	22
Total	91

Unfortunately, the July report can not be found. This is especially to be regretted, because the conditions to which the men were subjected during June and July had large influence in determining the number of cases of typhoid fever. We can only state that it is the testimony of all army officers at Tampa that the camp of this regiment near Tampa Bay Hotel became exceedingly filthy.

The August report is signed by Capt. and Asst. Surg. Charles Wilcox, who makes the following remarks:

The principal diseases are typhoid fever and diarrhea. I have not been able to ascertain the cause of the typhoid fever. Numerous cases of this disease existed when I reported to the regiment. The camp at Tampa was at first on low ground and part of the time was under water. August 10 we moved to higher ground and every precaution possible was taken to stamp out the infection. Diarrhea prevailed most widely among recruits and undoubtedly was largely due to indiscretions in eating. Most of the cases of continued fever that were transferred to other hospitals proved to be typhoid fever as nearly as I can ascertain.

At present the health of the command is improving. I have made a special report of the fever cases to Maj. Walter Reed, surgeon, U. S. Army. I am unable to find any reliable record previous to my arrival on July 29, and therefore had to start a new register beginning August 1. This regiment left Tampa, Fla., August 14, 1898, and arrived at Huntsville, Ala., August 18, 1898.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	908
Typhoid fever	51
Fever	186
Ephemeral fevers	29
Malaria	32
Remittent fever	1
Continued fever	13
Acute diarrhea	105
Subacute diarrhea	12
Acute indigestion	7

Chronic diarrhea	7
Acute intestinal colic	3
Chronic indigestion	2
Acute dysentery	1
Chronic gastritis	1
Other diseases	240
Total	690
Returned to duty	353
Discharged at expiration of service	2
Transferred to other hospitals	336
Otherwise disposed of	4
Total	695
Remaining on sick report:	
In hospital	7
In quarters	29
Total	36

Under date of September 17, 1898, Captain Wilcox made the following report to our board:

I inclose report of cases of typhoid fever and malaria occurring in the camp of the Fifth Cavalry from August 1 to the time of your visit at Huntsville, September 7. As you directed, I have endeavored to find the origin of the typhoid fever, and have also made attempts to determine whether or not certain tents have furnished an unusually large number of cases, but find it impossible to do this, owing to the fact that no register was kept before I joined the regiment and nothing definite can be ascertained. When I joined the regiment July 29, 1898, there were a great many cases of typhoid fever in quarters and many other cases had already been sent away. The acting assistant surgeon was sick and the few members of the Hospital Corps present had more work than they could well attend to. The regiment was encamped in a swamp where every condition was unfavorable. From the best information that I can obtain, I am led to believe that the first cases of typhoid fever appeared among recruits, and since August 1 by far the larger number of cases of undetermined fever transferred to other hospitals have been among recruits. Every precaution has been taken since I have been with the regiment, and I know that before that time the sinks were cared for as well as possible. The following is a statement of the number of cases of prolonged fever from August 1 to September 7:

Typhoid fever	54
Undetermined fever	213
Malaria	30
Ephemeral fevers	30
Total	327

The number of cases of fever has diminished rapidly. A few cases of continued fever still appear daily. These are sent to the Fourth Army Corps Reserve Hospital at once. There have been a number of cases of tertian fever, well marked, in which the plasmodium is easily demonstrable. At the division hospital they tell me that in some of the continued fevers they have found crescents, but I carefully searched without finding any. I am glad to state that since your visit I have not seen one case in the regiment that I could pronounce typhoid, while during August I do not know of any other regiment that suffered as much as ours. I regret extremely that my information is so meager that reliable data can not be given. I inclose blanks filled out.

Very respectfully,

CHARLES WILCOX,
Captain and Assistant Surgeon, U. S. Army.

The September report is signed by Charles H. Andrews without comment.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	832
Typhoid fever.....	6
Fever	35
Malaria	9
Continued fever	16
Ephemeral fever	11
Acute diarrhea	32
Acute indigestion.....	6
Acute intestinal colic	6
Subacute diarrhea	1
Subacute gastric indigestion	1
Subacute intestinal indigestion	1
Acute indigestion.....	1
Other diseases.....	156
Total	281
Returned to duty.....	180
Transferred to other hospitals.....	77
Total	257
Remaining on sick report:	
In hospital.....	7
In quarters.....	17
Total	24

During the month of September this regiment remained at Camp Wheeler, near Huntsville, Ala.

The October report is signed by Captain Wilcox, without comment.

CONDENSED SICK REPORT FOR OCTOBER.

Mean strength	919
Typhoid fever.....	1
Malaria	17
Ephemeral fever	7
Fever	4
Continued fever	1
Acute diarrhea	33
Acute indigestion.....	5
Acute intestinal colic	5
Subacute diarrhea	3
Acute dysentery.....	1
Chronic dysentery.....	1
Other diseases.....	178
Total	256
Returned to duty.....	205
Discharged for disability	1
Transferred to other hospitals	30
Total	236
Remaining on sick report:	
In hospital	3
In quarters	19
Total	22

The above report covers headquarters, band, a detachment of the Hospital Corps, and 11 troops of this regiment. It appears that 1 troop of the Fifth Cavalry was sent to Porto Rico some time late in September or early in October. Unfortunately dates of movements are not given in any of these reports.

We have endeavored to ascertain the total number of

cases of prolonged fever in this regiment before any part of it went to Porto Rico. By going over carefully the regimental reports and the records of various hospitals we find the number of such cases to be 377. Evidently this regiment became badly infected at Tampa and carried this infection with it to Huntsville, Ala.

These 377 cases were diagnosed as follows:

Typhoid fever.....	219
Malaria.....	133
Undetermined fever	19
Diarrhea	5
Continued fever	1
Total	377

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bagley, Robert.....	Pvt., D.	1898. Aug. 22	Fort McPherson, Ga.	Typhoid.
Chappuis, Flavien L.	Pvt., L.	Nov. 7	Huntsville, Ala.	Acute septi-
				mic meningi-
				tis.
Davis, George	Pvt., K.	Sept. 17	Indianapolis, Ind.	Typhoid
				complicat-
				ed with
				dysentery.
Goy, Harry L.....	Pvt., F.	Aug. 21	Fort McPherson, Ga.	Typhoid.
Gump, Andrew E....	Pvt., A.	Aug. 28	General hospital, Fort Thomas, Ky.	Typhoid
				complicat-
				ed by
				intestinal
				hemorrhage.
Haas, Harry H	Private, band.	July 30	Field hospital Fourth Army Corps.	Typhoid.
Kelley, Michael.....	Pvt., D.	Aug. 16	West Tampa Hospital, Tampa, Fla.	Do.
Kemper, Ch	Pvt., K.	Aug. 26	Fort McPherson, Ga.	Do.
Liddy, Patrick	Pvt., M.	Aug. 23	United States general hospital, Fort McPherson, Ga.	Do.
Marvin, Henry	Pvt., K.	Aug. 12	Tampa, Fla.	Do.
Nixon, William.....	Pvt., M.	Aug. 16	West Tampa Hospital, Tampa, Fla.	Do.
Peterson, Theodore H.	Pvt., G.	July 26	United States general hospital, Fort McPherson, Ga.	Do.
Smith, Harry W.....	Pvt., H.	Sept. 26	Corps reserve hospital.	Do.
Steixner, Gottlieb	Pvt., I.	July 12	Tampa, Fla.	Do.
Webster, David.....	Pvt., H.	Aug. 24	Division hospital, Huntsville, Ala.	Do.
Wilcox, Fred L.....	Pvt., H.	1899. Jan. 5	Tipton, Ind.	Inflammation of brain.

Total deaths.....	16
Deaths due to typhoid fever.....	14
Percentage of deaths among cases of protracted fever (377), 3.71.	
Percentage of deaths among recognized cases of typhoid fever (219), 6.39.	

We are of the opinion that the number of recognized cases (219) approximately represents the actual number of cases of typhoid fever in this command.

GENERAL REMARKS CONCERNING FEVERS IN THE FOURTH ARMY CORPS.

The conditions of the various camps occupied by this corps have been given in connection with the different regiments. It will be seen that while water contamination can not be excluded in the camps about Tampa, typhoid fever must have been disseminated by other agencies in the encampments at Fernandina and Huntsville. Typhoid infection appeared among the regular troops at Tampa before any of the volunteer regiments reached that place. The Second and Thirteenth United States Infantry furnished recognized cases of typhoid

fever soon after reaching Tampa in May. The last-mentioned organization was stationed at Fort Niagara and Fort Porter, N. Y., when war was proclaimed, and it reached Tampa with 1 man sick with typhoid fever. So far as we have been able to ascertain, this was the first case of this disease among the troops assembled at Tampa and in its vicinity in 1898. On June 7, 1898, the Fourth Corps Reserve Hospital was opened, and on this date it received 9 cases of recognized typhoid fever. Three of these were from the Thirteenth Infantry, and 1 each from the Second, Fourth, Sixth, Sixteenth, Twenty-second, and Twenty-fourth Infantry, and before the last of June the following additional regular regiments sent cases of recognized typhoid fever to this hospital: Second and Fifth Cavalry, and Third and Eleventh Infantry. It will thus be seen that many of the regular regiments entered upon the campaign already infected with typhoid fever. There is, therefore, no difficulty in accounting for the introduction of typhoid fever into the camps about Tampa, since many of both regular and volunteer regiments reached that place bringing with them the infection.

The following table shows at least approximate facts concerning typhoid fever in the regiments, the histories of which we have just given.

Seven regiments of the Fourth Army Corps.

Regiment.	Strength in July.	Total number of probable cases.	Percentage of troops with typhoid fever.	Number of recognized cases.	Total deaths.	Deaths due to typhoid fever.	Percentage of deaths among probable cases.	Percentage of deaths among recognized cases.
First Ohio.....	1,085	221	20.36	27	10	9	4.07	33.33
One hundred and fifty-seventh Indiana.....	1,080	219	20.27	2	18	14	6.39	700.00
Third Pennsylvania.....	783	922	11.74	23	12	10	10.86	43.47
Thirty-second Michigan.....	1,239	253	20.41	34	20	19	7.50	55.88
Second Georgia.....	1,100	184	16.72	47	14	13	7.06	27.65
Fifth Ohio.....	1,320	310	23.48	88	22	20	6.45	22.72
Fifth United States Cavalry.....	900	219	24.33	219	16	14	6.39	6.39

^aThis figure emphasizes the failure to diagnose typhoid fever in this regiment, inasmuch as there were 14 deaths from this disease while only 2 cases were recognized by the regimental surgeon.

Table showing, for the regiments of the Fourth Corps (assembled at Mobile, Chickamauga, and Tampa), the mortality and morbidity from typhoid fever.

Regiments.	Mean strength.	Cases of typhoid fever.		Deaths from typhoid fever.	Deaths from all diseases.	Deaths from typhoid fever in 100 cases.		Percentage of deaths from typhoid to deaths from all diseases.	Morbidity of typhoid fever in 1,000 mean strength.		Deaths from typhoid fever in 1,000 of mean strength.
		Certain.	Certain and probable.			Certain.	Certain and probable.		Certain.	Certain and probable.	
Fourth Army Corps.											
First Ohio	1,085	27	221	9	10	33.33*	4.07	90.00	24.88	203.68	8.29
One hundred and fifty-seventh Indiana	1,080	2	219	14	18	.....	6.34	77.77	1.85	202.77	12.96
Third Pennsylvania	783	23	92	10	12	43.47	10.86	83.33	29.37	117.49	12.77
Thirty-second Michigan	1,239	34	253	19	20	55.88	7.50	95.00	27.44	204.19	15.33
Second Georgia	1,100	47	184	13	14	27.65	7.06	92.87	42.72	167.27	11.81
Fifth Ohio	1,320	88	310	20	22	22.72	6.45	90.90	66.66	234.84	15.15
Fifth United States Cavalry	900	219	219	14	16	6.39	6.39	87.50	243.33	243.33	15.55
Total	7,507	440	1,498	99	112	22.50	6.60	88.39	58.61	199.54	13.18

Total strength of these regiments in July.....	7,507
Total number of probable cases of typhoid fever in these seven regiments.....	1,498
Percentage of probable cases of typhoid fever in these regiments.....	19.95
Number of recognized cases of typhoid fever in these regiments.....	440
Number of deaths due to typhoid fever in these regiments..	99
Percentage of deaths among probable cases of typhoid fever.....	6.60
Percentage of deaths among recognized cases of typhoid fever.....	22.50

It will be seen from these figures that the percentage of deaths among probable cases of typhoid fever in these regiments is slightly lower than it was among the troops at Chickamauga, while the percentage of deaths among recognized cases is considerably higher.

We are quite confident that the number of cases of probable typhoid fever in the Third Pennsylvania Volunteer Infantry as given in the above table is much too low. On the other hand, it is possible that we have overestimated the number of probable cases of typhoid fever in the First Ohio Volunteer Infantry.

We have elsewhere stated that we have reason for believing that malaria was more frequent among troops stationed at Tampa than it was among those encamped at Chickamauga. The board did not have opportunity to have blood examinations made among the troops of the Fourth Army Corps, and our reason for believing that malaria was more prevalent among those troops is founded upon information furnished us by Dr. G. W. Moorehouse, resident physician of the Lakeside Hospital at Cleveland, Ohio. The Fifth Ohio Volunteer Infantry was from Cleveland and when disbanded its sick were sent in part to this hospital. Here blood examinations were made by Dr. E. P. Carter. The malarial organism was found in 23 individuals from this regiment. In 5 of these cases malaria and typhoid fever were coincident.

We append a table showing for the regiments of the Fourth Army Corps the mortality and morbidity from typhoid fever.

CHAPTER XI.

TYPHOID FEVER IN THE FIRST AND SECOND DIVISIONS, SEVENTH ARMY CORPS.

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TYPHOID FEVER IN THE SEVENTH ARMY CORPS, JACKSONVILLE, FLA.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Lieut. Col. L. M. Maus, chief surgeon of the Seventh Army Corps.]

Jacksonville and Miami, Fla.—The testimony of Colonel Maus was taken at various times between the 28th of August and the 5th of September, 1898. Colonel Maus could not say exactly how long the troops had been at Jacksonville, but the Second Division arrived here about the 15th or 18th of May. Some of the regiments have been here a little over three months. Several of those regiments of the Second Division were already on the ground when he arrived (May 29), but of this division the Second New Jersey, Second Virginia, Fiftieth and Forty-ninth Iowa, and the Fourth Virginia came a little later. All the regiments of that division have changed their camp sites except one brigade. Four brigades (of the corps)

moved to new sites three or four weeks ago. The regiments of the First Division would have been removed some time ago, but their commanders remonstrated and the corps commander permitted them to remain upon their old camp sites. They had their water pipes all in, their sinks all arranged, as well as the bath houses and conveniences. Naturally, if they moved they would have all these conveniences to install over again.

We have had no regiments either from Chickamauga or from Tampa, except the First Ohio, which had been at Tampa and arrived here last night from Fernandina, Fla., where it had been in camp for some time with other regiments which also had been stationed at Tampa, Fla.

The commands of this corps consist of troops coming directly from their State encampments, except in the cases of the First Division, which came here by way, first, of Mobile, Ala., and second, Miami, Fla. There are 17 regiments here which have come directly from

their State encampments, and, although they have been here for two or three months, they still have little typhoid—if 4 regiments are excepted. A few of these 17 regiments have been here only a short time. The Third Nebraska has been here about a month, the Ninth Illinois a month, the Sixth Missouri has been here about three weeks, and the First Ohio, as above stated, has only just arrived.

Colonel Maus stated that he had had the general milk supply investigated pretty thoroughly. It had been found that the milk venders sometimes mixed water from the shallow wells with the milk. There was no way of examining the water for typhoid bacilli, for we have no laboratory. It should be remarked that the town authorities have pretty stringent regulations about the milk supply, but it is adulterated. The board of health is very active; many of the business men are on the board, and they watch these things pretty closely on account of the yellow fever.

The Second Division is located in the suburbs of the city of Jacksonville, and is furnished from the water supply of that city. There are artesian wells all over the country around here, and the Third Division is supplied from the artesian well at Panama Park by pipes which the authorities have run through the Third Division camps. This water is sulphur water. In the city itself it flows into reservoirs, and the sulphur gas escapes, the water being free from any taste or smell of gas. Down at Panama Park, however, the water distributed among the companies comes direct from the well and has the sulphur taste. The First Division is supplied with water received from the artesian well of the Country Club, near the division camp, at Fairfield, near Jacksonville. This well is 800 to 1,000 feet deep.

In the suburbs of the city of Jacksonville there are a number of shallow wells. The city artesian water is not piped out among all the suburbs, and the people there, as well as in the country beyond, use the old shallow wells.

Soldiers have frequently been noticed drinking from the waysides. We have issued prohibitory orders upon this subject, and the instructions have been given by company and regimental commanders.

Not a single soldier has been officially supplied with water from shallow wells, but the entire city is surrounded by these shallow wells, 10 to 15 feet deep, and every negro shack for the vending of things to eat and drink has one of them in its back yard. The soldiers will patronize these little shacks, and there are any number of these little booths scattered around selling lemonade made in such a way. We finally had to prohibit the sale of the stuff at all. I believe a great deal of typhoid was introduced into the camp in that way.

A great many soldiers from regiments encamped in the suburbs of the city of Jacksonville have wandered among the suburbs and drank from the wells in the

back yards of the negro houses, although they have been repeatedly cautioned against drinking that water. But you know what the men are. They will drink it in a spirit of bravado. You can not make them understand the necessity of drinking good water. Sometimes the men have gone off on outings, or target practice and drills, filling their canteens from these wells.

The city also has a sewage system, which does not extend out beyond certain limits. Beyond these limits superficial privy pits are used. The poorer inhabitants have these pits in the back yard.

At Panama Park, in the Third Division, they use the pit system for the disposal of waste. In the First Division they have a sewage system connected with the river, with water flowing into the sewers and flushing them out. These sewer pipes are connected with the company latrines by a special arrangement which permits the emptying and flushing directly into sewers. In this division, however, they at first were using the old-fashioned pits and throwing dirt upon the excrement. In the Second Division, encamped within the city limits, pits are not permitted by the city authorities. Movable half barrels were placed in the latrines for the reception of feces and urine.

Questioned as to what regiments had arrived at Jacksonville already infected with typhoid fever, Colonel Maus replied: "There has been more or less typhoid fever in all of the regiments which have been here so long, but those which are known to have brought the infection with them are as follows: The Fourth Virginia came from Richmond, having been encamped in a place where they used surface wells, and within ten or twelve days after they arrived here they had 5 deaths from typhoid. It is a patent fact that the colonel of this regiment, the surgeon, and everybody else connected with the regiment knew that the water was villainous and that they brought a considerable amount of typhoid with them. Since their arrival, however, they have practically gotten rid of their typhoid fever." Colonel Maus could not give offhand the number of cases of typhoid fever that had occurred in that regiment.

The Second Mississippi came here from Jackson, Miss., where they had been using in their State encampment water from the Pearl River, which is notoriously filthy. That river is filled with dead logs and decomposing vegetable matter. Nearly all the mortality suffered by this regiment occurred within two weeks after their arrival here in Jacksonville. They have had nearly 40 cases of typhoid, and nearly every one of them can be traced to that river. This regiment must have arrived here about the 10th of June. "I arrived here on the 29th of May, and they came in ten or twelve days later." The health of this regiment is greatly improved. When they came here they had the parchment, yellow-pumpkin complexion, and you could have identified a Mississippi man abroad on the streets of Jacksonville by his peculiar appear-

ance. They came from the swamps of Mississippi; in fact, they called two or three companies of this regiment "swamp heads from Natchez." The regiment is now stationed at Panama Park, about 5 miles below Jacksonville, on an excellent site, and is supplied with artesian water.

There are two regiments here having noteworthy histories. The First Wisconsin is one of them. It had been here quite a long time on the same site, but it has now moved on an excellent site outside of town, where they have as good a camp ground as there is in Florida. We have at present in the Second Division Hospital 130 cases of typhoid fever from that regiment. There is no doubt, however, that most of them were infected here. There were a great many walking cases of typhoid fever in that regiment. But this regiment was peculiarly located—a "shell road" passed through it, two companies being located on either side of this road and very near to the latter. Their tents were perhaps not more than 30 or 40 feet from the road. During June it was very dry here, and there was lots of fine dust which drifted on either side of the road, and "I am quite satisfied that the fecal matter that had been splashed out from the scavenger wagons passing along this road mixed with that dust and was inhaled by the men of these two companies. Besides, these men would be walking across the road and carrying dust into their tents." Most of the typhoid fever in this regiment came from these two companies. The peculiar location of these two companies in regard to this road and the scavenger wagons forced itself upon our minds. This was one of the regiments that employed in the removal of feces movable half barrels placed in sinks. The location of the camp being within the city limits the city authorities would not permit pits to be dug. The city hauled away the waste and burned it up, but as they hauled it away mixed with urine no doubt a good deal of it spilled along the road. They had regular wagons for hauling the half barrels, and loaded these wagons with ten or twelve of them at a time.

Then, again, the Second Illinois Regiment came here in pretty good shape. One company thereof—F, I believe—on the 29th of May had some very bad meat for dinner. The whole company was fed on this beef, and had gastroenteric trouble, ptomaine poisoning, etc., and the whole company was sick for ten days or two weeks from the time they ate that meat. They soon had 30 or 40 cases of typhoid fever in that company, there being scarcely any in the rest of the regiment—all in that company. And these men had eaten that tainted meat, and had vomited and purged right after doing so, and for ten or twelve days they suffered from anemia and all sorts of consequences, being sick and lying around their tents. Typhoid broke out among them and several died. We had autopsies on every fatal case, and found ulceration there, and one or two

examples of perforation. "I tell you that looks to me very curious. There was no typhoid infection in that meat as far as we could see, no typhoid bacilli; and yet in two weeks from that 30 or 40 cases of typhoid fever in that one company. This tainted meat was thoroughly cooked. I had a thorough investigation made, and found that it had been cooked in the Hunt ovens—that is, it was baked." Replying to a question as to whether the company had other chances of being infected, such as a practice march, Colonel Maus stated: Not to his knowledge, but they had eaten this meat, and it was found that some of them had bathed in the St. Johns River. Yet that did not account for the typhoid of the whole company. This regiment arrived here at Jacksonville with the first troops about the middle of May. They arrived here practically in good shape from Springfield, Ill. Yet I understand the water was bad there, and they had some fever. We investigated the milk supply of that company and found that there had been no large quantity of milk used. The dairymen, however, have rinsed their cans from the surface wells. Nothing peculiar was found out about the milk supply of that company about that date. There is not enough milk in town for the troops, and a good deal of milk has been sent here from a distance. The result of the whole investigation is that the tainted meat was the only thing that could be found. There was no special fever accompanying this ptomaine poisoning outbreak, but the men were gaunt and weak and acted as if they were poisoned, and prostrated with weak stomachs and inertia and never very well; in fact, generally broken up. As has already been said they were very anemic. The surgeon asked for a large quantity of iron to remedy their anemia.

Questioned as to the source of the supply of the meat, Colonel Maus replied: "Armour furnishes the meat; they send it in carloads." He could not say whether it was the meat from one animal or not. He could only say that it was tainted badly, but the men ate it.

Questioned as to what regiments arrived in Jacksonville in good shape, Colonel Maus resumed: "There is the Second United States Volunteer Cavalry, of Wyoming; I do not think that they have had more than 2 cases of typhoid fever, and yet they have been here six weeks, having come direct from their State camping grounds. Then there is the Third Nebraska, arriving here from its State encampment. This regiment has not been here more than two or three weeks, and it is getting in a bad state of health. Another regiment arriving here without typhoid fever is the Second New Jersey, coming from its State camp at Seagirt. It has been here about two and one-half months. This regiment has at present about 65 cases in hospital; not all of them typhoid; say 30 to 35 cases of typhoid. They came here all right." Questioned as to his explanation of the origin of the typhoid fever in this regiment, Colonel Maus replied: "Well, my belief is that most of these

men drank of the surface well water and drank those soft drinks—lemonade and orangeade—that were made from surface well water in the shacks around them. They could get as much of this stuff as they could drink for 5 cents, and half a dozen men would drink a bucketful of it. Another regiment free from the disease upon its arrival is the Fourth United States Volunteer Infantry, having arrived here not more than two weeks ago—Pettit's regiment, some of whose companies come from Fredericksburg, Va."

As to the First Division, Colonel Maus declared that when this division came to Jacksonville its hospital here where the sick were treated ran along with not more than 25 cases of typhoid fever; yet there are seven regiments belonging to that division, all of them direct from Miami (where there had been much typhoid fever), except the Fourth Volunteer Infantry. Notwithstanding this, those regiments—viz, First and Second Texas, the First and Second Louisiana, and the First and Second Alabama—are now in the most excellent state of health. The surgeon of the Second Texas told me yesterday that they had 12 sick in quarters and 14 or 15 in the hospital, out of a strength of 1,300 men. Thus the regiments of that division are practically getting rid of their typhoid fever.

Speaking generally as to the diseases peculiar to the location, Colonel Maus stated that the Jacksonville city physicians declare that a great many of our fevers are "malarial," but it must be understood that they diagnose all continued fevers as malarial; in fact, all cases that have not pronounced typhoid symptoms. "As I have said, they call continued fevers malarial, but I do not believe that there is a fever that runs along three or four weeks and has a typhoid range of temperature that is not typhoid. I have treated a great many cases in which there was not a thing to indicate that it was typhoid, except the range of temperature."

Questioned as to whether, with the water supply and the method of the disposal of waste matter already mentioned and with a good camp police, there has, in his opinion, been any occasion inside of the camp sites for the origin of typhoid fever, Colonel Maus replied substantially as follows: In the Second Division many of the regimental surgeons do not recognize these cases as typhoid fever, and if they did recognize them they had not sent them to the division hospital, because the men did not want to go. This has been the case to a great extent in the Wisconsin regiment. "Why, the surgeon of the Wisconsin regiment sent two or three men to the division hospital that died in seventy-two hours. I think that some of these typhoid cases would use the tubs (employed in that division for the disposal of feces), and if the contents were spilled in the streets, or within the camp limits, by the scavengers, the disease could have originated by infection in this way. I do believe the First Wisconsin got theirs in that way—I think they got it through the dust. Such a mode of

origin is spoken of by military surgeons elsewhere. The men of the First Wisconsin camped along the road where the contents of the tubs splashed out and became mingled with the dust. The dust could thus become laden with bacilli and enter the fauces." There was no sudden outbreak of typhoid fever beginning about the same time in all the regiments; it was only so in the case of the First Wisconsin.

The fever at Jacksonville goes by the name of "malarial fever." Some of the citizens here have protested that the doctors were exaggerating the amount of typhoid fever in the Second Division Hospital. This is the oldest division in camp, and has been complete for two months or more with 12,000 men. General Arnold is the commander. This division has always used the tub system for the disposal of feces. "These so-called 'continued malarial fevers' are quite interesting to me, because of my four years' experience in Texas, where I had to treat 40 or 50 of these cases each year." The people in town here are claiming that the doctors were making mistakes in calling it typhoid fever. Many of the sick men in the camps slipped away from their regiments and went into various boarding houses and (civil) hospitals for treatment. An officer of the Forty-ninth Iowa thought that the regimental surgeon was not up to his standard, and went to the city. The city physician claimed that his case was one of "malarial fever." The regimental surgeon saw him, and pronounced it typhoid. After the officer's death an autopsy was made, and 2 feet of ulcerated intestine was found of the most frightful character. Some of the men of another division were not satisfied with the regimental surgeon, and called in another city physician for treatment. These cases which had been called "malarial fever" were ultimately sent to the division hospital, and three of them died, the autopsies showing characteristic ulcers. "There is one city physician here, very prominent and having a large practice, who, the people say, has more typhoid than all the others put together, and loses more cases. The other city physicians call this disease 'malarial fever.'"

Colonel Maus said: "There is some genuine malarial fever here—genuine chills and fever. I went through one company of the Second New Jersey that had 39 men on the sick report and requested the colonel to have all of these men held in their companies so that I could examine them. They only showed me, however, 15 of these cases. The rest had been sent to Pablo Beach or elsewhere. Of the 15 I found 33 per cent suffering with genuine chills and fever—every indication of malaria. The men have a chill every day or alternate day. I also found several men who, the surgeon said, had fever two or three days—not defined enough to send to the hospital. I requested the surgeon to send to division hospital every such case that has a record of fever for two or three days."

Reverting to the history of the First Division, Colonel

Maus said: "It is made up chiefly of regiments which have been at Miami, Fla., before coming to Jacksonville. They suffered dreadfully from typhoid fever while there. I went down there on an inspecting tour about the 14th of July and found the hospital with nearly 400 cases in it from these 6 regiments, many of them fevers which the hospital doctors diagnosed as 'continued malarial fever.' Moreover, there were 900 or 1,000 men in these regiments sick in quarters, and there were besides a great many suffering with diarrhea and dysentery. The division-hospital surgeons said that they had 8 cases of 'typhoid fever,' but I picked out 40 cases [of typhoid] before I got to their 8. I saw that the men had diarrhea and gurgling, and I then examined the whole lot that they called 'malarial fever,' and I said, 'Gentlemen, these are typhoid-fever cases.'"

Asked if those regiments at Miami were free from typhoid fever when they arrived there, he stated: "They all came from Mobile and were practically free from typhoid upon their arrival." He believed those regiments reached Miami somewhere about the middle of June and remained there until about the 1st of August. They came to Jacksonville at different times during a week somewhere about the second week of August. At Miami they lost a great many cases from typhoid fever. When that division (the First) left Miami for Jacksonville, 300 or 400 cases were left behind in hospital at Miami, and they brought a number of cases with them. One regiment left 3 to 5 cases at St. Luke's Hospital, and about 4 of these died in that hospital. Some of the cases now in the First Division Hospital developed here (at Jacksonville), but since their arrival here their sick report has come to be very small.

As to the water supply at Miami, two or three surgeons told him that the water was frightful. In the Royal Palm Hotel this water was highly colored, it possessed a decided marshy odor, and it had a sediment besides the odor. They told him it was the water supplied by the city, and it came from the everglades 4 miles distant, which were filled with grass to the top of the water. This water was piped to the town, and thence distributed to the soldiers in iron pipes running upon the surface of the ground. This water was, of course, surface drainage, the rains having washed the country for miles around. That was the city supply that the proprietors called so fine. In addition to this supply in the camps, the regimental commands had driven wells through the coralline formation, which constituted the soil, 10 to 18 feet deep.

The water from these wells was 10 to 15 degrees colder than the everglade water, which latter, as has been stated, was distributed through pipes running upon the surface of the ground, and the men preferred the former. This pump water contained chalk formation and looked cloudy. "I advised the colonels of the regiments and the division commander to abandon this pump water, and cause the pump handles to be removed.

They had eight or ten of these pumps in each regiment driven down 10 or 15 feet. The regiments, therefore, had two sources of water supply—the city supply of the everglade water and the supply coming from the driven wells, which latter I consider to be even worse than the former. The chief surgeon of the division maintained that the water was good. The surgeon of the Second Louisiana claimed that the water was very bad, and had sent some to his brother, who was State chemist, for examination. I procured eight 1-gallon jugs for the purpose of obtaining various specimens of the different waters. I filled six of these jugs with water obtained in the regiments, and one jug was filled from the general city supply and one more from a spring about half a mile away that was called a 'boiling spring.' All of these specimens were sealed and sent to Washington for examination. This water was pronounced unfit for use. I believe the jug containing the water from the boiling spring got broken. I expressed my opinion to the general commanding the division concerning this water. The chief surgeon of the division claimed that the water was 'all right,' and some of the regimental medical officers insisted that it was 'all wrong.' At this time 10 or 12 per cent of the command were sick. The land interests had become indignant at the charges made against the water supply, and they telegraphed to Miami to bring civil suits against those men who made the charges. My report to Colonel Garland (Greenleaf?), the reports of Wood, the commissary, and myself, were held back, and we could not get any action thereon. Reports of the medical officers went for naught."

When questioned as to the method of disposal of feces at Miami, Colonel Maus stated: "Excrement was effectively disposed of by means of the sewer system, a sewer pipe running through the grounds flushed out with water. That was the method employed by a part of the command at Miami. Besides the sewage system, in connection with the sinks for a part of the command, there was much resort to the surrounding bushes by the men. In fact, the First Division continued this practice to a considerable extent here in Jacksonville in the woodland adjoining their camp."

Colonel Maus thought that the origin of typhoid fever at Miami was due to the water supply—driven wells particularly. Most of the inhabitants of the town of Miami filtered their water, and the people at the hotel used mineral water; but the negro element there used water from the wells, and there is a great deal of typhoid fever among the negroes.

Colonel Maus said substantially: There are no regimental hospitals in this corps. He succeeded in carrying out the order abolishing them. An order was issued requiring the regimental hospitals to be abolished and the surgeons to surrender their hospital tents, cots, etc. "I actually sent out and took these things, leaving them without one tent to use as a sick room. The division

hospitals have worked here very successfully, indeed, and the surgeons have learned that the regimental system is useless in the field. We have about $2\frac{3}{4}$ per cent of the mean strength in the hospitals, and I presume that counting the men that are sick in the regiment the figures would run to 5 or 6 per cent of the whole command. In San Antonio, Tex., for two summers I treated 35 or 40 cases out of a strength of 750. If you estimate the ratio among 30,000 men you will find that we have no larger sick rate here, if you throw out of the count the four regiments—First Wisconsin, Second Mississippi, Second Virginia, and Fourth Illinois—that brought typhoid with them when they came here.”

Colonel Maus volunteered some remarks explaining the difficulties which had been encountered in establishing proper discipline in the sanitary organization of his corps. “You must remember that when this corps was organizing here it was a very difficult matter to issue any orders which would be effective. The only effective way to proceed was to go to the people themselves and give instructions verbally. When we first began the organization it was impossible to get a report through military commanders. If it was sent through the brigade headquarters, it would go into the desk there; and if it went to division headquarters, it would stop there. So also if a letter was addressed to the chief surgeon, it might go to the chief surgeon of a hospital, and he would keep it; if a chief surgeon to brigade was mentioned, it might be that the chief surgeon of division would get it. By reason of these difficulties a great many of our instructions were given personally and verbally to the officers themselves. Of course the whole thing seems ridiculous from the military standpoint. For instance, I would go straight to the officer instead of to the adjutant. Thus we dealt directly. If a regimental surgeon would send a man to me for a certificate of discharge on account of disability, I would not think of sending it back to him to go through the proper military channels, but I would send it to him by man on horseback and have it corrected. You can scarcely realize it—it was impossible here to transact military business by pursuing military methods. Every staff officer had to go and see the men and tell them how to do. The colonels did not know better, nor the adjutant, nor the surgeons, nor the commanders. It has been most difficult. They did not want to bother with papers; they did not understand them. They would come and ask the most simple questions, and, paying no attention, would come and ask the same questions over again the next day.”

[R. N. Ellis, chief of water department of city of Jacksonville.]

Jacksonville, Fla.—This testimony was taken September 2, 1898. Asked to describe briefly the nature of the waterworks, the kind of water, whence it comes, and how it is distributed, Mr. Ellis said: “Our water supply is derived entirely from artesian wells. We

have four of them attached to the city waterworks. One is a 10-inch well 1,020 feet deep, one is a 12-inch well 960 feet deep, and two are 6-inch wells which have a depth of 630 and 650 feet, respectively. All these wells have a static head of about 61 feet above tide water. The pressure is alike in all of them; there is not a half pound's variation. The chemical and physical qualities of the water proceeding from each of these wells is about the same. Analysis has been made a number of times but it never varies materially. The water contains sulphureted hydrogen, which is entirely dissipated by aeration. It also contains total solids to the extent of 22.27 grains per gallon.

“The water is not stored here in the city, except in the reservoir for fire purposes, but this stored water is never drawn upon. There is a water tower which holds 230,000 gallons which is emptied and filled many times a day. This is for the whole city of Jacksonville. Our full pumping capacity is 11,500,000 gallons, furnished by two pumps of 5,000,000 gallons capacity each and one pump of 1,500,000 gallons capacity. There is a pump well which holds nearly 400,000 gallons. We pump direct from that well. The water falls over into two basins which are about 50 feet in diameter. In the wells the pipes extend about 8 feet above the surface, allowing the water to fall over the top of the pipe in a thin sheet in order that the gas may be disseminated. The water again falls into the basins from a pipe extending 5 or 6 feet above the surface, and here again it receives another aeration, thus allowing for a thorough escape of the sulphureted hydrogen so complete that you can not notice it in the water which is distributed in the mains. From this central pumping station the water is distributed through about 43 miles of pipe, varying from 16 to 4 inches in diameter, but there is very little of the 4-inch pipe. The above-mentioned capacity for pumpage was calculated for more than the inhabitants of Jacksonville. We have been using 2,000,000 gallons per day and have a pumping plant for a full water supply of 11,000,000 gallons daily. The fire reserve is held in the reservoir before mentioned, having a capacity of 2,500,000 gallons, but this has never been used. The population of Jacksonville is about 30,000, and there are at the present time about 30,000 troops here in the neighborhood in addition. This has practically doubled the number of people drawing daily upon the capacity of the water supply. In addition to this there is an increased floating population of perhaps 5,000.

“The inhabitants of Jacksonville, between their lawns and their bath tubs, use about 60 gallons per head. As near as it can be made out, the soldiers use about 10 gallons per head. The difference on account of the lawns between a wet and a dry day in our pumping is half a million gallons. As high as 2,700,000 gallons have been pumped some days, yet the average pumping is a little over 2,000,000 gallons. It is always indicated by the pumpage whether the day has been wet or

dry, for there is always a big difference. In the wet season the pumpage is light."

Mr. Ellis stated that the extension of the pipage for the water supply of the encampment has all been done under his supervision. He thought there was but one regiment which had arrived in camp before the water mains for the camp of that command had been laid, and even in that case they were ready with the water turned on within two, or three hours of its arrival. The regiments began to come in one, two, or three a day, and all through the encampment new regiments have arrived from time to time until lately. A member of the board remarked: "That means, of course, that from time to time you have had to extend your pipage into these new camps, and in order to do that it has been necessary to tap the mains, and for that purpose to turn the water off temporarily from certain areas. I suppose you have a record in your department of the details of the variations or dates upon which a certain extension has been made, or times upon which the water has been turned off from certain mains in order to make connections for extensions." Mr. Ellis replied: "We can tell pretty nearly. I do not know that we have been particular about the turning off of the water, because we do not generally have to turn off the water for more than a block at a time. It has been necessary (once or twice) to shut off the long mains running to the camp for an hour or an hour and a half." This encampment pipage had not been plotted on the journal of daily operations, but there are diagrams of it. Mr. Ellis did not know whether dates of these extensions would be recorded, because there was really no object in keeping any record of that kind. It would of course be known where the work was done and when, but the exact dates of turning the water off have not been kept as a rule, but "I do not think there were any times when we kept the water turned off for more than two or three hours. The longest delay was at Panama Park. One of the 4-inch pipes burst about 180 feet from the well and we had to put in a new pipe, which necessitated cutting off the whole camp at that place for three or four hours. That was the Third Division. That division has had several misfortunes. They got their water shut off once or twice by having the valves turned off. Some of their men around there tampered with the valves. This has been the cause of trouble more than anything else."

One of the board thereupon remarked: "We noticed yesterday when inspecting the Third Division Hospital that on the high hill the water was not running during the day, and the officers there said that since the arrival of the regiment located immediately below them the draft on the water pipes by these newly arrived commands had lessened their pressure very much—indeed, to the extent that sometimes during the day when the taps were opened the water would not run out." Mr. Ellis replied: "Torrey's camp (that of the volunteer cavalry)

is on that line, and they are careless of shutting off the faucets. I went out there one afternoon and found not less than ten faucets running, there being only 24 or 25 pounds pressure (from the well) and the camp at the hospital being 20 feet higher. If they had a tank at this hospital that would hold 4,000 or 5,000 gallons, I think this difficulty would be remedied."

A considerable part of the population in the suburbs of the city of Jacksonville is not supplied with the city water. Many of these inhabitants have shallow surface wells in their yards, from which they obtain their water supply. In most cases in the suburbs the method employed to construct them is by driving a pipe down into the rock.

Requested to describe the average structure of the soil and strata in the construction of the artesian wells from the top down to the water, Mr. Ellis said: "We have a top soil composed of sands of various shades of fineness for about 20 feet in many places. In other places, instead of this, clay. Then about 20 feet down fossil rock is encountered of fine shells and fine particles of quartz. This is where they have the cochina (fossiliferous porous rock). Permeating this rock are veins of water. The uppermost layers of this rock are 20 to 25 feet below the surface of the ground, and the rock itself is 20 to 25 feet in thickness. Then under that rock we sometimes go into a stratum of water-bearing sand, but as a general thing we get into what is known as the Port Hudson blue clay, and this is 300 to 400 feet thick. When we get into this solid, heavy bed of clay nothing else has ever been struck until we pass it and strike a layer of sand above rock. Then we get into this rock, which is a close, fossilized rock, almost as hard as obsidian. Then we pass through soft rock 20 to 30 feet and continue in the latter all the way down to a very hard shell rock, which gives a flow of water. In the second artesian well we bored, which I watched very closely, at 700 feet there was a flow of just half as much water as we got at 1,000 feet. Between 700 and 1,000 feet we doubled the flow. We have never bored below 1,020 feet here. At St. Augustine they bored 1,400 feet. At 1,250 feet they struck brackish water."

The water from the driven wells of the suburbs above mentioned is that which comes from the first stratum of shell rock. There are quite a number of shallow wells still in use in the suburbs around the city. The pipe lines of the city water supply extend into some parts of the suburbs, but the extension was only made last fall, and the inhabitants there are generally of the poorer class of people, and it is believed that they do not feel able to introduce the water supply of the city in place of their shallow wells. Besides that, they like the well water. The water from the dug wells, which is rain water percolated through sand, is much preferable to the city water for washing—the city water standing at 60 degrees on Clarke's scale for hardness.

In the country around the city, after you get outside the suburbs, the open or dug well is the one usually encountered, but you will also find there many driven wells. They are very easily put down if there is a little clay to be driven through. These driven wells are not so practical where the soil is of sand.

The city of Jacksonville proper has had this artesian water since 1886, when the first well was put down. Mr. Ellis thought that the surface wells are now pretty generally abolished in the city proper, and he thought the city authorities prohibited the use of these wells within the city proper for drinking purposes.

Mr. Ellis was strongly convinced that the health of the city of Jacksonville had been affected very much for the better by the use of the city water supply.

[Dr. Claude Joyner, president board of health of city of Jacksonville.]

Jacksonville.—Questioned as to the health of Jacksonville prior to the installation of the improved water supply, Doctor Joyner stated that "typhoid fever has been very little known in Jacksonville until the present time. Cases of this disease had been remarkably few even before the introduction of the artesian wells. In fact, it is not at all prevalent in this country. Upon investigation of the matter I was surprised to find how little typhoid there was as a general thing. There is no regulation requiring cases of typhoid fever to be reported. It is only in case of death that we require a report to us to be made. The health records, therefore, of the city of Jacksonville do not show the cases of typhoid fever which have occurred; only the deaths. Last year there were 8 deaths from typhoid in the whole city; the year before there were 12, and the year before that about 9."

Questioned as to whether the records would distinguish between deaths in the city proper and in the suburbs, Doctor Joyner replied: "I looked up the records for the last three months and found there was 1 death from typhoid fever in June, a colored child in the suburbs; 3 in July, 2 of these colored, in the suburbs, the third in the city; and during August there were 3 deaths, 2 of them in the city and 1 in the suburbs."

As to the general method of disposal of fecal matter in the suburbs: "Sewers are now being extended into the suburbs, but for the most part the suburbs do not yet have them. They generally have the earth closet. The city does not allow a pit to be dug. The excrement is dropped upon the surface of the ground under the privies, where it accumulates. We require these privies to be thoroughly cleaned and limed at least once a month by the scavengers. The waste material is taken away by them and cremated in the sanitary crematory, having three very large odorless furnaces, where we burn all garbage, dead horses, dead animals, fecal matter, etc. A dead animal of any kind, even a horse, is taken in whole. All the garbage is removed from the city and cremated daily. The night soil is removed

every night to this crematory. It is removed in tight barrels, the material being shoveled into them. There is not here what they call in some of the northern cities an odorless excavator. The combustion in this crematory is so perfect that there is no complaint whatever in the neighborhood; absolutely no odor. The scavengers employed by the city authorities for the removal of waste from the encampments of soldiers are not the same people as those who are doing similar work for the city. They are new men. I know only of one of these men who has had typhoid fever, and he resided outside of the city limits, not using the city water supply."

The wells in the suburbs are very shallow, some not more than 8 or 10 feet deep, and in rainy weather you can almost reach the water. Mr. Ellis stated that "there is no doubt but that they [the soldiers] drank a good deal of this water. When the Alabama regiment came here they discovered a well near them whose water was probably 4° or 5° colder than the city water, and they went to this well with their canteens. I told them the water was not fit for use. The man of the adjoining house came to me and wanted to know what he could do, since they were ruining his pump. I took the handle off. The fact is, when the well water is cooler than that from the pipes, it is hard to keep the men from using the pump water." Dr. Joyner continued: "The average rainfall is 48 to 54 inches." It was here remarked by Mayor Knight: "I recommended the removal of the Second New Jersey and the Second Illinois, but neither of the colonels of these regiments nor General Burt, the commander of the brigade, wanted to move. When this regiment first came here we thought they were located at a low place and they had better not make their arrangements to stay there. General Lawton stated that he wanted these regiments right near the road. Mr. Stockton had told them that in the rainy season they would find the ground to be low. General Lawton replied that the military people would take care of their own drainage. The city of Jacksonville subsequently spent \$500 or \$600 in opening drains from this locality to the river or they would have been flooded." Mr. Stockton (being present with the city authorities at this interview) remarked: "I made this statement to General Lawton: 'This is not any place for a camp.' He said 'We take care of our own drainage.' Unfortunately, Florida had a great habit of having a pond at the top of a hill. You get wet ground where you expect to have dry."

Questioned as to whether in the city or in the suburbs during this season of the year (August and September) intermittent or remittent fevers prevail, Doctor Joyner said: "We usually have a great deal of such fevers, and early in the season have the old-fashioned chills and fever. I think most of the malarial fevers come from the districts where the ponds are, but where the troops are located there is not very much lowland, and I think

there is very little malarial fever there, remittent or intermittent." It was remarked by a member of the board and assented to by Mr. Ellis that there is a small-sized marsh within the encampment of the Ninth Illinois—a little cypress pond. Doctor Joyner resumed: "There is more or less of malarial fever. The district is not exempt from it."

A member of the board remarked: "There are a good many cases of typhoid occurring in the various regiments which are not perfectly clear as to diagnosis, especially in the earlier stages of the fever. Our object is to discover whether a part of the fever now occurring is not of the malarial type. They are from regiments which have never been subject to malarial diseases, and their officers say they are having 'malarial remittent fever.' If you do not have that disease in this country the inference would be that many of these cases are mild typhoid, so that if you have 'malarial remittent fever' in this section of the country in the fall, it changes the aspect of matters." Major Keane, commanding the Second Division Hospital, being present, said: "When I was stationed at St. Augustine, Fla., Doctor Guiteras was there, investigating the question of mild yellow fever. He made a careful blood examination of a number of 'continued fevers' there and he did not find the malarial organism in one of them, and I believe they were mild cases of typhoid." Mr. — stated: "I came from middle Florida and was in the habit of having chills and fever, and lived on them, having them every other day. I have now lived in Jacksonville twenty-five to twenty-seven years, and have not, during this time, had them at all." Some one remarked that Colonel Maus had declared the autopsies of these cases of fever showed that they were all typhoid. Hereupon a member of the board remarked: "I do not think 'malaria fever' kills many people, even in Florida." Doctor Joyner stated: "We found the organism (malarial parasite) in a number of cases in July, when we had the time to examine them." These examinations were made by Surgeon Clarke of the Second Division Hospital; they were in intermittent cases. Major Keane remarked: "In some continued cases Major Clarke thought that he found the malarial organism—several cases in which we had a dispute as to whether there was a double infection."

Doctor Joyner, the health officer, promised to furnish the board with a transcript from the health records for the five years previous to and subsequent to the installation of the artesian water supply as to deaths from "continued fever."

(a) **The weather at Jacksonville, Fla.**

First period, from May 15 to July 25.—There were five "waves" of high temperature, usually coincident with relative dryness and light wind movement per diem. The dates of elevation of these five hot "waves" (at or above 90° mean maximum temperature) were,

respectively, as follows: The first, May 17 to 21; the second, May 26 to June 4; third, June 11 to 20; fourth, June 24 to July 1, and fifth, July 15 to 24.

During this period no very considerable rainfall took place, while the maximum temperature was as high as 90°; only four times did the rainfall then reach one-half inch in quantity (May 25, June 17 and 20, and July 24). During the whole of this period the only time of continuous wet weather extended from July 4 to 15, culminating on the 8th, 11th, and 12th, respectively, in very heavy rainfalls.

The general wind movement during the first period averaged less than 8 miles per hour. It did not once reach an average for the day of 9 miles per hour at any time coincident with the high waves of hot and dry weather above mentioned.

The prevalent direction of the winds during this period likely to carry much dust from place to place was from the south and southeast, the latter especially in the afternoon. The following are the only dates of this period when the winds blew from the north: May 30, morning, north; June 1, morning, north; 5th to 9th, varying between north and northwest (slight rain on the 6th); 13th, evening, northeast; 17th, afternoon, northeast (0.75 inch rain); 18th morning, northwest (light rain); 19th, morning, northwest; 22d, morning, northwest (0.65 inch rain on the 20th, and 0.3 inch rain on the 21st); July 4, morning, northeast. On the 11th and 12th, morning and evening, respectively, the wind was south, north; north, north. But it must be remembered that from July 4 to 15 it could not have been dusty; on the contrary, rather, was it wet and muddy. It is noteworthy that of the above exceptions to the general prevalence of southerly winds those after the 17th of June, inclusive, were on days of more or less rainfall, when "the dust" must have been more or less "laid."

Second period, from July 26 to September 6.—This period was not marked by great waves of heat as was the first. There was but little variation of the mean maximum temperature from 91° in the first twenty days; in the next ten days but little change from 87°; within the last ten days but little change from 90°.

During this period the times of low humidity coinciding with absence of rain were, respectively, from the 3d to the 9th of August; from the 13th to the 15th; from the 23d to the 26th, and from the 31st to the 6th of September.

In the intervals of these short seasons of low humidity there was, as a rule, more or less rainfall. From the 26th of July to the 1st of August, inclusive, there was more or less rainfall, amounting on the 28th to 0.98 inch; on the 9th, 10th, and 11th of August amounting, respectively, to 0.55, 0.85, and 1.35 inches, these three days of rain coinciding with the time of high humidity in the afternoon. There was also a rainfall of 0.75 inch on the 16th. There was another period of high humid-

ity from the 19th to the 21st, coinciding with slight rain on each day as well as on the previous. There were four days of more or less rainfall also, from the 26th to the 30th of August, the heaviest being on the 26th (0.55 of an inch).

The general wind movement during this period averaged less than 8 miles per hour. On the 3d and 4th of August the average movement was about 11 miles per hour. On the 9th, 10th, and 11th, the dates of the heavy rain above mentioned, the wind movement averaged about 9 miles per hour.

The prevalent direction of the winds during this period liable to carry much dust from place to place was, from the 26th of July to the 9th of August, inclusive, from the south and southeast. The only exceptions were as follows: On the 29th and 31st of July, respectively, in the evening, north (slight rain); in the morning, northwest; and on the 4th of August, in the evening, northwest. From the 10th to the 16th of August, inclusive, the direction of the wind was from the north part of each day. During this time, however, there could not have been much dust carried by the wind, for it was during considerable rainfall. From the 17th to the 28th of August the prevalent wind direction was again southerly and southeasterly, but during this time there were only three days when it is probable there was much dust transported, namely, from the 22d to the 24th, inclusive. On the 29th and 30th the wind was from the north in the afternoon, but there was a slight rainfall on each of these days. On the 6th of September the wind blew from the northwest in the morning, without rain.

Third period, September 7 to October 13.—This period was marked by a generally falling temperature, but there were two distinct general waves in the curve of maximum temperature culminating, respectively, on the 24th of September and the 3d of October.

The only times of relative dryness during this period coinciding with the elevations of these waves were one between the 25th of September and the 1st of October and the other on the 13th. The first time of relative dryness in this period, however, coincided with a general depression in the maximum temperature curve—from the 10th to the 16th of September.

As a rule the rainfall during this period coincided more or less closely with the times of highest degree of relative humidity. The first rain of the period was on the 7th, 8th, and 9th of September (0.55, 1.2, and 0.05 inches, respectively). There was again a slight rain on the 13th and 14th of less than 0.1 of an inch, and another fall of 0.2 on the 17th. On the 21st and 22d there was a precipitation of 0.45 and 0.28 inch, respectively; on the 23d, a trace; on the 24th and the 25th, 0.12 and 0.08, respectively. From the 29th of September to the 5th of October, inclusive, there was more or less rain each day, not reaching a precipitation of one-half inch,

however, except on the 2d of October, when the rainfall amounted to 3.55 inches. Again on the 9th and 10th there was a slight rainfall, and on the 11th a fall of 0.48 of an inch.

The wind movement during this period varied considerably, while the general average movement arose to somewhere near 8 miles per hour. There were three times when the wind velocity was much above that figure—on the 12th of September the average during the day was 12 miles per hour; on the 2d of October the average was 19 miles per hour, and on the 10th it averaged 10 miles per hour.

This period was characterized by a prevalence of northerly winds. The days of exception to this rule were as follows: On the 8th of September the wind was southerly (1.2 inches of rain); again on the 22d and 23d the wind was southerly (rain each day); on the 2d, 3d, and 4th of October the wind was southerly (coincident with rainfall). It is noteworthy therefore that during this whole period the only times when the winds were likely to carry dust was when they were coming from a northerly direction.

Fourth period, from October 13 to 31.—The chief characteristic of this period is that the temperature curve showed sharp and frequently alternating depressions and elevations, following each other at intervals of two or three days, the mean maximum temperature generally falling from 85° at the beginning to 63° at the end.

The character of the curve representing humidity coincided very closely with that representing temperature. The days of lowest humidity were as follows: October 15, 16, 18, 19, 24, 26, 27, and 31. It is noteworthy, however, that these dates of lowest relative humidity are synchronous with the lowest points of the temperature curve.

On the 17th, 18th, 20th and 21st there was rain. There was rain also on the 25th and 26th and on the 29th and 30th.

The curve representing wind movement during this period has the same general character as those mentioned for temperature and humidity; that is, more or less sharp variations separated by periods of two or three days. It is to be remarked, however, that while the temperature curve is generally downward, the general movement of the wind curve is slightly upward. The general average of wind movement per diem for the period is about 200 miles, giving a wind velocity per hour of a little more than 8 miles.

The prevalent direction of the wind during this period varied considerably, but may be said to have been generally from the north. The exception to this rule was on the 17th (rain 0.88 inch), 21st (rain), and the 22d. It is probable, therefore, that on these few days when the wind was blowing exceptionally from the south it was not charged with dust.

(b) **Meteorological conditions.**

The graphic meteorological chart for the city of Jacksonville, Fla., in the volume of charts, gives in detail for that locality day by day the maximum, minimum, and mean temperature, the per cent of morning and evening mean relative humidity, the rain precipitation, the extent of cloudiness, the wind movement in miles per twenty-four hours, and the direction of the wind morning and evening. For detailed meteorological changes we refer to that chart.

May (from the 15th to the 31st, inclusive).—The mean maximum temperature was 87.1°, mean minimum temperature 65.9, and the general mean 76.5. The maximum temperature on the 15th was 84°; rising to 93 by the 18th; falling to 85 by the 23d; rising to 97 by the 30th; falling to 92 on the 31st.

The per cent of mean relative humidity in the morning on the 15th was 82; rising to 92 on the 16th; the same on the 17th; falling more or less regularly to 80 by the 26th; rising to 90 on the 27th; falling regularly to 82 by the 31st. The per cent of evening humidity was, on the 15th, 82; falling by the 17th to 72; rising by the 19th to 78; falling to 73 on the 20th; rising somewhat irregularly to 88 by the 25th; descending to 85 by the 27th; falling irregularly to 55 by the 29th; rising regularly to 80 by the 31st.

There was a rainfall of 0.9 inch on the 25th; on the 26th, a trace; on the 27th, 0.02; on the 30th, 0.4.

Cloudiness from the 15th to the 31st, inclusive, varied but little from 0.3.

The wind movement on the 15th was 185 miles; 16th, 188; 17th, 165; 18th, 165; 19th, 275; 20th, 210; falling by the 23d to 167; increasing by the 25th to 280; falling on the 26th to 188; on the 27th, 182; increasing to 206 by the 29th; remained the same on the 30th; falling to 160 on the 31st. The average wind movement during this period was less than 8 miles per hour.

The wind direction from the 15th to the 31st, inclusive, morning and evening, respectively, was: S, SE; S, SE; S, SE; W, SE; S, SE; S, SE; SE, SE; E, SE; SE, SE; SW, SW; SW, SW; W, SE; S, S; S, E; SW, SW; SW, SW; NW, S.

June.—Mean maximum temperature was 90.9°, the mean minimum was 72; the general mean temperature was 81.5. The daily temperature during this month reached its lowest point on the 6th at 80°, and its highest point on the 13th, 17th, 18th, 26th, and 29th of the month at 96.

The per cent of mean relative humidity averaged in the morning about 85; at no time going higher than 90, which it reached on the 15th. The evening relative humidity varied somewhat more considerably than did the morning relative humidity. On the 20th it was 100; on the 25th it was about 93; and on the 24th and 29th, respectively, it was 73 and 63; the average being about 80.

There was a slight rainfall on the 4th and 6th of, re-

spectively, about 0.1 and 0.2 inch; on the 11th, 13th, and 14th there was a trace of rainfall; on the 17th there was a rain precipitation of 0.7 inch; on the 18th less than 0.1 inch; on the 19th a trace; on the 20th a little over 0.6 inch; on the 21st 0.3 inch; on the 25th, 26th, and 28th a trace of rainfall.

The average cloudiness for the first ten days of the month was about 0.3; from the 11th to the 20th it was about 0.6; from the 21st to the 23d it was 0.3; from the 25th to the 28th about 0.45; and from the 28th to the 30th 0.3.

During the whole of the month the wind movement per diem varied between 150 and 225 miles, except on the 29th, on which date it increased to 287 miles, the general average being less than 7 miles per hour.

The wind direction from the 1st to the 5th, inclusive, morning and evening, respectively, was N, E; E, E; S, S; SW, NW; NE, NE. From the 6th to the 16th, inclusive, it was N, NE; NW, NE; NW, NE; NE, SE; SE, SE; SW, SE; SW, SW; SW, NE; W, SW; S, SE; S, SE. From the 17th to the 21st, inclusive, it was SW, NE; SW, S; SW, SW; SW, SE; SW, SW. From the 22d to the 30th, inclusive, it was NW, E; E, E; E, SE; S, SE; SW, S; S, SE; SW, SE; SW, SE; W, SE.

July.—The mean maximum temperature was 90.8°; the mean minimum, 73.2; the general mean was 81.9. The maximum temperature started on the 1st, at 92°; falling regularly to 85 by the 4th; going to 90 on the 5th, and to 92 on the 7th; falling again by the 11th to 77; ascending again regularly to 98 on the 18th; continuing about at that point until the 20th and 21st, when it gradually fell to 89 by the 25th; rising again to 93 by the 28th and 29th; sinking to 90 on the 30th, and going back to 93 on the 31st.

The per cent of mean relative humidity in the morning increased gradually from 85 on the 1st to 87 on the 10th; on the 11th it was 100; it fell again until the 14th, when it was 82, remaining about this point until the 20th, when it began to rise, reaching 92 on the 24th; it gradually fell again to 75 by the 27th; rising again to 84 by the 31st. The evening relative humidity started at 80 on the 1st; rising to 100 on the 5th; falling to 85 on the 6th; rising again to 95 on the 8th; falling to 76 on the 9th, and to 80 on the 10th; rising to 100 on the 11th; standing at 98 on the 12th; falling again to 85 on the 13th, and to 68 by the 16th; remaining about that point until the 19th; rising to 83 by the 21st; remaining about that point until the 24th; vacillating between this and 90 until the 27th; then falling to 70 by the 29th; rising to 93 on the 30th, and falling to 76 on the 31st.

The rainfall was as follows: On the 4th, 0.15 inch; on the 5th, 0.6; on the 6th, 0.35; on the 7th, 0.02; on the 8th, 1.75; on the 9th, 0.2; on the 11th, 2.3; on the 12th, 3.08; on the 13th, 0.03; on the 14th, 0.02; on the 15th, 0.23; on the 20th, 0.03; on the 21st, 0.04; on the 22d, 0.02; on the 23d, 0.07; on the 24th, 1.1; on the 25th,

0.55; on the 26th, 0.02; on the 27th, 0.12; on the 28th, 0.97; on the 29, 0.04; on the 30th, 0.01; on the 31st, 0.02.

The cloudiness started at the first of the month at 0.3; increasing to 0.7 by the 5th; remaining at that degree until the 8th, when it decreased to 0.4 on the 9th, and again increased to 1 by the 11th, and gradually decreased again to 0.3 on the 15th; remaining at about that point to the 19th, when it gradually increased to 0.8 by the 25th; remaining near this degree until the 30th, and then decreasing to 0.3.

During the month the wind movement per day varied between 100 and 200 miles. Between the 7th and 15th, inclusive, it began to increase, on the 7th rising from 110 to 350 by the 10th, decreasing to 200 on the 11th; increasing again to 310 by the 13th; falling rapidly to 125 by the 15th; the daily average for the month being not greater than 7 miles per hour.

The wind direction from the 1st to the 7th, inclusive, morning and evening, respectively, was SE, SE; SE, SE; SE, SE; NE, S; SW, S; S, S; S, E. From the 8th to the 15th, inclusive, it was W, SW; S, SW; S, S; S, N; N, N; SE, SE; SE, SE; SE, E. From the 16th to the 31st, inclusive, it was S, SE; SW, SE; SW, SE; NW, SE; SW, SW; SE, SW; SW, E; SW, SE; SW, E; SW, E; W, NW; S, SE; S, SE; S, N; SW, SE; NW, S.

August.—The mean maximum temperature was 89.8°; mean minimum, 74.4; the general mean, 80.1. On the 1st, the maximum temperature was 92°; on the 2d, 88; rising by the 5th to 94, and falling on the 6th to 88, and going up again gradually to 93 by the 9th; falling to 90 on the 10th; going back to 93 by the 12th; falling regularly to 85 by the 16th; moving between this point and 89 until the 22d; on the 23d it was at 91; falling to 88 on the 24th; rising to 92 on the 25th and 26th; falling gradually to 88 by the 28th; rising to 90 on the 30th, and remaining there on the 31st.

The per cent of mean relative humidity in the morning on the 1st was 85; it remained pretty constantly at this point, varying not over 5 degrees up or down, until the 17th; on the 18th it was 93; on the 19th and 20th it was 87; on the 21st, 95; on the 23d, 87; on the 24th, 95; on the 25th, 85; on the 27th, 90; on the 29th, 85; on the 30th, 95; on the 31st, 85. The per cent of evening humidity on the 1st was 83; on the 2d and 3d, 77; on the 4th, 82; on the 5th, 70; gradually rising from that point to 93 on the 10th and 11th; falling back to 75 by the 13th; ascending irregularly to 95 by the 20th; falling to 90 by the 22d and to 77 by the 23d; rising again gradually to 93 on the 26th; falling to 88 on the 30th and 75 on the 31st.

The rainfall on the 1st was 0.05; on the 6th and 7th there was a trace; on the 9th, 0.52; 10th, 0.85; 11th, 1.32; 12th, 0.15; 13th, a trace; 15th, 0.03; on the 16th, 0.75; 18th, 0.05; 19th, 0.12; 20th, 0.08; 21st, 0.38; 22d, 0.17; 26th, 0.55; 27th, 0.03; 28th, 0.25; 29th, 0.06, and 30th, 0.08 inch.

The cloudiness varied somewhat from 0.4 on the 1st to 0.7 on the 10th and 13th, respectively; falling to 0.3 by the 15th; increasing to 0.8 on the 16th; falling to 0.3 on the 17th; increasing to 0.8 by the 21st; falling again to 0.3 by the 23d; increasing gradually again to 0.8 on the 27 and 28th; falling to 0.5 on the 29th; going back to 0.8 on the 30th, and standing at 0.7 on the 31st.

The wind movement per day was, on the 1st, 104 miles; on the 2d, 273; on the 3d, 294; on the 4th, 175; on the 5th, 6th, and 7th, about 150; rising to 240 by the 9th; decreasing gradually to 120 on the 14th; increasing to 220 on the 15th; falling to 160 on the 16th; rising to 210 on the 17th; falling to 160 by the 19th; rising to 187 on the 20th; falling to 115 by the 23d; rising to 190 by the 25th; falling to 130 by the 27th; rising to 205 on the 28th; falling to 140 on the 29th; rising regularly to 243 by the 31st. The average during the month was about 7 miles per hour.

The wind direction morning and evening, respectively, from the 1st to the 14th, inclusive, was S, E; E, SE; SE, S; SE, NW; E, SE; SE, SE; SE, SE; SE, S; S, S; E, NE; S, NE; E, NE; S, NE; NE, NE. From the 15th to the 31st, inclusive, it was, respectively, NE, NE; N, S; SE, SE; SE, SE; SE, SE; SE, SE; S, SE; SW, S; SW, SE; SW, S; S, SE; S, S; S, SW; SE, W; SE, NE; NW, N; W, SE; SE, SE.

September.—The mean maximum temperature was 86.5; the mean minimum, 73.1; the general mean, 79.9°. The maximum temperature on the 1st was 92°, remaining about this point until the 6th, when it fell to 84 on the 7th; increased to 86 by the 10th; it fell to 79 by the 14th; rising again regularly to 89 by the 18th; falling gradually to 85 by the 21st; rising again to 91 on the 23d; falling to 84 on the 25th; rising to 88 on the 28th; falling to 84 on the 29th, and ascending to 86 on the 30th.

The per cent of mean relative humidity in the morning on the 1st was 90; varying slightly to 83 on the 4th; rising gradually to 90 on the 9th; falling gradually to 85 on the 12th; rising to 90 on the 14th; falling to 75 on the 15th; rising pretty regularly to 100 on the 19th; falling to 85 on the 20th; rising to 95 on the 21st; descending irregularly to 85 on the 25th; ascending to 94 on the 26th; descending to 77 on the 28th; rising to 88 on the 30th. The per cent of mean relative evening humidity was at 88 per cent on the 1st; 75 on the 3d; rising gradually to 95 by the 7th; descending gradually to 75 on the 12th; remaining about at that point until the 14th, when it reached 90 on the 17th; remained at this point until the 24th, when it irregularly fell to 75 on the 28th, and rose again to 88 on the 30th.

There was a rainfall of 0.02 inch on the 5th; 0.55 on the 7th; 1.18 on the 8th; 0.05 on the 9th; 0.08 on the 13th; 0.04 on the 14th; 0.20 on the 17th; a trace on the 20th; 0.45 on the 21st; 0.26 on the 22d; a trace on the 23d; 0.12 on the 24th; 0.09 on the 25th; 0.02 on the 29th; 0.35 on the 30th.

The cloudiness stood at 0.3 on the 1st; increasing

pretty regularly to 0.8 on the 7th and 8th; decreasing to 0.3 on the 11th; increasing to 0.7 on the 14th and 15th; falling to 0.3 on the 16th; increasing to 0.7 on the 17th; falling to 0.4 on the 19th; increasing to 0.8 on the 21st; decreasing to 0.6 by the 24th; remaining near this degree until the 30th.

The wind movement was about 190 miles during the 1st, 2d, and 3d; falling to 112 by the 8th; increasing regularly to 295 by the 12th; falling again pretty regularly to 140 by the 19th; increasing gradually again to 220 by the 22d; falling to 110 by the 24th; rising to 198 by the 26th; falling to 168 on the 27th; increasing pretty steadily to 173 by the 30th. The average wind movement during this period was less than 7 miles per hour.

The wind direction morning and evening, respectively, from the 1st to the 15th, inclusive, was SE, SE; SE, SE; SE, SE; SE, S; SE, S; NW, SE; S, NE; SW, S; NE, NE; NE, NE; NE, NE; NE, NE; N, NE; N, N; N, NE. From the 16th to the 30th, inclusive, it was NE, NE; N, N; N, E; NE, NE; NE, NE; NE, NE; NE, E; SE, SE; S, W; NW, S; NE, NE; NE, NE; NE, NE; NE, NE; NE, NE; E, NE.

October.—The mean maximum temperature was 78.1; the mean minimum temperature was 61.8; the general mean was 69.9°. The maximum temperature on the 1st was 81°; falling to 78 on the 2d; rising to 90 on the 3d; falling more or less irregularly from that point to 84 on the 9th; remaining there until the 11th; rising to 87 on the 12th; falling from that point more or less regularly to 72 on the 15th; rising to 80 by the 17th; falling to 70 on the 19th; rising to 80 on the 20th, and remaining there until the 21st; falling to 65 on the 22d; going up to 76 by the 25th; falling to 63 by the 27th; rising to 78 on the 28th; falling with semiregularity to 63 on the 31st.

The per cent of mean relative humidity in the morning on the 1st was 77; on the 2d, 100; on the 3d, 90; rising slightly to 93 on the 6th; falling to 82 on the 7th; standing at 92 on the 8th and 9th; falling back to 82 on the 10th; rising regularly to 87 on the 13th; falling gradually to 60 on the 16th; rising to 88 on the 18th; falling to 70 on the 19th; rising to 93 on the 21st; falling to 75 on the 22d; rising to 93 by the 25th and 26th; falling to 60 on the 27th; rising to 97 by the 29th; the same on the 30th; falling to 63 on the 31st. The per cent of evening humidity on the 1st was 90; on the 2d, the same; falling by the 6th to 82; rising on the 7th to 87; the same on the 8th; remaining about that point until the 11th; falling to 73 by the 13th; then rising to 83 on the 14th; falling to 57 by the 16th; rising to 95 on the 17th; falling to 63 on the 18th; rising to 95 by the 20th; falling to 63 by the 22d; ascending to 93 by the 25th; falling to 63 on the 27th; rising to 90 by the 28th; the same on the 29th; falling to 60 on the 30th, and remaining the same on the 31st.

The rainfall on the 1st was 0.03 inch; on the 2d, 3.55; on the 3d, 0.35; on the 4th, 0.02; on the 5th, 0.1; on the

9th, 0.02; on the 10th, 0.03; on the 11th, 0.46; on the 14th, 0.03; on the 17th, 0.87; on the 18th, 0.09; on the 20th, 0.25; on the 21st, 0.22; on the 25th, 0.35; on the 26th, 0.27; on the 29th, 0.05; on the 30th, 0.02.

The cloudiness on the 1st was 1; on the 2d, the same; on the 3d, 0.4; lessening gradually to 0.2 by the 8th; increasing regularly to 0.6 by the 11th; decreasing regularly to 0.1 by the 15th; increasing to 0.9 by the 17th; decreasing to 0.3 on the 18th; the same on the 19th; increasing to 0.9 by the 21st; decreasing to 0.2 by the 23d; increasing to 1 on the 24th; decreasing regularly to 0.6 by the 27th; increasing to 0.9 on the 28th; decreasing regularly to 0.1 by the 31st.

The wind movement on the 1st was 315 miles; on the 2d, 480; falling regularly to 130 by the 4th and to 110 on the 5th; rising with some regularity to 265 by the 10th; falling to 110 by the 13th; rising somewhat irregularly to 245 by the 18th; falling to 155 on the 19th; increasing to 250 by the 22d; falling to 135 on the 23d; rising to 203 on the 24th; falling to 120 on the 25th; rising to 230 by the 27th; falling irregularly to 188 by the 31st.

The wind direction morning and evening, respectively, from the 1st to the 5th, inclusive, was N, N; NW, S; S, S; S, E; E, SE. From the 6th to the 13th, inclusive, it was N, SE; N, NE; NE, NE; NE, NE; NE, NE; NE, N; NW, E; N, NE. From the 14th to the 31st, inclusive, it was S, NW; NW, NE; NE, E; E, SE; NW, NW; NW, NE; NE, E; S, S; W, W; W, NE; NE, NE; NE, E; NW, NW; N, N; NE, N; NE, NE; NW, NW; N, NE.

The following were the meteorological conditions, as shown by the meteorological chart (see vol. of charts) for Jacksonville, Fla. (from May 15 to October 31, 1898):

Clouds.—In general terms, the degree of cloudiness may be said to have more or less gradually increased fortnight by fortnight from May 16, when it was 0.3, until July 25 at 0.8; it then varied between this and 0.3 up and down a number of times until September 21, when it was 0.8; it then decreased more or less steadily until by the 15th of October it had fallen to 0.1; from the latter date to the 31st of October it increased again by great fluctuations, to fall back to the same point on the last day of the month. The only marked exceptions to this general statement were on the 11th, 12th, and 13th of July, on the 1st and 2d of September, and again on the 24th of October, when the cloudiness was complete and corresponded with heavy rains and high winds, save on the last date, when there was neither rain nor much increase of wind. During the whole time there was not a day of absolutely clear sky for twenty-four hours.

Rain.—Of the 169 days from May 15 to October 31, 1898, there were 92 upon which there was more or less rainfall. On 44 of the 92 there was only a trace of rain. This leaves but 48 days which may be designated as more or less rainy. Of these rainy days, only 7 gave a rainfall of more than 1 inch, and besides these only

13 presented rainfall of a half inch or more. The dates and quantity of rainfall, in decimals of an inch, when the precipitation was 0.1 inch or more, follow: May 25, 0.9; 30, 0.4; June 4, 0.12; 6, 0.22; 17, 0.75; 20, 0.65; 21, 0.3; July 4, 0.16; 5, 0.6; 6, 0.35; 8, 1.75; 9, 0.2; 11, 2.3; 12, 3.08; 14, 0.2; 15, 0.22; 24, 1.1; 25, 0.55; 27, 0.12; 28, 0.98; 30, 0.1; August 9, 0.52; 10, 0.85; 11, 1.3; 12, 0.15; 16, 0.75; 19, 0.12; 21, 0.38; 22, 0.17; 26, 0.55; 28, 0.25; September 7, 0.55; 8, 1.19; 17, 0.2; 21, 0.46; 22, 0.28; 24, 0.13; 25, 0.1; October 1, 0.37; 2, 3.57; 3, 0.35; 5, 0.1; 11, 0.47; 17, 0.87; 20, 0.27; 21, 0.21; 25, 0.34; 26, 0.27.

The periods of continuous days of more or less rainfall were as follows: May 25, 27, and 30; June 4 to 6, 17 to 21, 25, and 26; July 4 to 15, 20 to August 1, 6, 7, 9 to 13, 15, 16, 17 to 21, 27 to 31; September 5, 7 to 9, 13, 14, 17, 20 to 25, 29 to October 5, 9 to 11, 14, 17, 18, 20, 21, 25, 26, 29, and 30.

The periods of storm and heavy rain were July 8 to 12 and October 2.

Humidity.—The general average per cent of mean relative humidity increased from fortnight to fortnight more or less gradually from 82 on May 15 to 92 on the 18th of September, and then decreased generally and more or less regularly to about 83 by the 14th of October and to 65 on the 15th, increasing again after that with great fluctuations until the 29th, when it reached 94, decreasing again by the 31st to 62 per cent. It should be remarked that during this slow but pretty constant, though at times more or less irregular, increase of mean relative humidity from May 15 to September 18 there were a few days when the fluctuations from the general ratio of slow increase were decided, at times above at times below the general ratio. It is noteworthy that during this period the evening mean relative humidity as a rule presented by far the greatest and most frequent fluctuations. Usually the heaviest rainfall coincided with considerable elevations of the per cent of evening humidity above this general ratio. Thus, of the eighteen rainfalls giving a half inch or more of precipitation from May 15 to October 31, there were thirteen which coincided with a rise of the evening mean relative humidity; while there were only two coincidences of a half inch or more of rain where the rise in humidity was greater in the morning than in the evening. Moreover, there were only three occasions (July 11, September 19, and October 2) when the relative morning humidity reached 100 per cent, the first and last coinciding with heavy rain and storm, the middle one corresponding neither with rain nor high winds.

Temperature.—Following general characteristics of the curves representing the mean diurnal temperature from May 15 to October 31, we may conveniently divide this time into four periods for clearer study.

First period, May 15 to July 25: In this period there were five general elevations or waves in the curves, cul-

minating, respectively, on the 18th (maximum, 93) and 30th (maximum, 97) of May, 17th (maximum, 96) and 29th (maximum, 96) of June, and 18th (maximum, 98) of July; separated by six general depressions, namely, May 15 (maximum, 84) and 23 (maximum, 85), June 6 (maximum, 80) and 21 (maximum, 88), July 11 (maximum, 77) and 25 (maximum, 89). It is noticeable that four of these general depressions corresponded with rainfall and that three of them fell at times when there was increased wind movement. The greatest diurnal difference between maximum and minimum temperatures usually coincided with the elevations of the curves, while the smallest occurred during the deepest depressions. The least diurnal variation (9°) took place on the 11th of July, when the per cent of relative humidity (morning and evening) was 100 and there were heavy rain and increased wind movement.

Second period, July 26 to September 6: The temperature curves for this period are characterized by the pretty constant general level maintained, with variations of only a few degrees up and down (maximum, between 94° and 85°); there were no very marked "waves." During this period the average diurnal difference between maximum and minimum was a few degrees less than in the first period. The least diurnal variations occurred from the 16th to the 22d of August (10° to 16°).

Third period, September 7 to October 13: This period is distinguished by the inauguration of a general fall of temperature, accompanied by a series of alternating general depressions and elevations or waves, there being two general depressions, each followed by its general elevation, which, however, reached a height less than the preceding one. It is remarkable that, while the lowest point of the first general depression, September 14 (maximum temperature, 79), is accompanied by increased wind movement, it coincides with low relative humidity and but very slight rainfall. This depression is followed by a general elevation or wave which near its crest coincides (on September 19) with 100 per cent of relative humidity, but no rainfall or increased wind movement. The highest point of this wave is reached on the 23d (maximum temperature, 91). The second general depression which follows reaches its lowest point on the 2d of October (maximum temperature, 78) accompanied by the greatest wind storm (480 miles) and the heaviest rainfall (3.55 inches) of the encampment at Jacksonville, the mean relative humidity having at that time again reached 100 per cent. The succeeding second general wave rapidly gained its culmination (maximum temperature, 90) on the next day and then fell off gradually to the end of the period on the 13th of October (maximum temperature, 85). This period is also marked by the smallest average diurnal variations between maximum and minimum temperatures, the least of all naturally met with during the heavy storm on the 2d of October, the difference being only 5° .

Fourth period, October 13 to 31: This period is dis-

tinguished by a rapid general fall of the temperature curves in successive abrupt depressions and elevations, following each other at intervals of two or three days, the first depression descending to 73° maximum temperature on the 15th of October and the last falling to 63° maximum on the 31st. During this period the diurnal variations between the maximum and minimum temperatures are, especially in the depressions, much greater than in the third period. It is noteworthy that there is a striking general similarity and synchronism during this period of the "waves" of temperature, humidity, cloudiness, and wind movement; the latter, however, are inverse of the other three. It is to be remarked in this connection also that while there is a general decrease in temperature, there is a general increase in humidity, cloudiness, and wind movement.

N. B.—The general curve of minimum mean temperature from June 11 to October 10 is nearly level if we estimate by the chief depressions, which nearly always stand at 70°; the greatest elevation of the minimum curve only once goes as high as 8° above this point.

The mean temperature from May 15 to 31 was, maximum, 87.1; minimum, 65.9; general mean, 76.5. From June 1 to 30 it was, maximum, 90.9; minimum, 72; general mean, 81.5. From July 1 to 31 it was, maximum, 90.8; minimum, 73.2; general mean, 81.9. From August 1 to 31 it was, maximum, 89.8; minimum, 74.4; general mean, 80. From September 1 to 30 it was, maximum, 86.5; minimum, 73.1; general mean, 79.9. From October 1 to 31 it was, maximum, 78.1; minimum, 61.8; general mean, 69.9.

Wind.—The general character of the curve representing wind movements permits of a division into four periods identical with those under which the temperature has just been considered.

First period, May 15 to July 25:

Movement.—If, starting at the commencement of the wind-movement curve on May 15 at the point representing a total movement of 185 miles per diem, we were to draw a straight line to the position of this curve on the 25th of July, where it represents a total movement of 100 miles, we would obtain a slightly descending base line, from which we might roughly estimate the tendency of the general wind movement during this period. We would then observe that throughout the period there was a more or less irregular but general decrease in the total daily movement of the wind, starting at an average of 8 or 9 miles per hour at the beginning of the period and ending at an average of 5 or 6 miles per hour at the end. Only three times the total daily wind movement rose much above the general ratio of decreasing movement for the period, each time coinciding more or less closely with considerable rainfall. There was rain also at the end of the period, when the wind movement was lowest.

Direction.—The prevalent direction of the wind

morning and evening was, respectively, in five-day periods as follows: May 15, S, SE; S, SE; S, SE; W, SE; S, SE; 20, S, SE; SE, SE; E, SE; SE, SE; SW, SE; 25, SW, SW; W, SE; S, S; S, E; SW, SW; SW, SW; NW, S. June 1, N, E; E, E; S, S; SW, NW; 5, NE, NE; N, NE; NW, NE; NW, NE; NE, SE; 10, SE, SE; SW, SE; SW, SW; SW, NE; W, SW; 15, S, SE; S, SE; SW, NE; NW, S; SW, SW; 20, SW, SE; SW, SW; NW, E; E, E; E, SE; 25, S, SE; SW, S; S, SE; SW, SE; SW, SE; W, SE. July 1, SE, SE; SE, SE; SE, SE; NE, S; 5, SW, S; S, S; S, E; W, SW; S, SW; 10, S, S; S, N; N, N; SE, SE; SE, SE; 15, SE, E; S, SE; SW, SE; SW, SE; NW, SE; 20, SW, SW; SE, SW; SW, E; SW, SE; SW, E; 25, W, NW.

Second period, July 26 to September 6:

Movement.—A straight line representing the general average wind movement for this period would be nearly level at about 170 miles per diem, giving an average wind velocity of about 7 miles per hour. This would generally correspond with the level line of which we have spoken when discussing the general characteristics of the temperature curves of the same period. Three times the curve representing the wind movement rose decidedly above the general average of the period, twice on days of dryness and absence of rain (August 3 and 31) and once during three days of considerable rainfall (August 9 to 12).

Direction.—The prevalent direction of the wind morning and evening was, respectively, in five-day periods as follows: July 26, S, E; S, SE; S, SE; S, NE; SW, SE; NW, S. August 1, S, E; E, SE; SE, S; S, SE, NW; 5, E, SE; SE, SE; SE, SE; SE, S; S, S; 10, E, NE; S, NE; E, NE; S, NE; NE, NE; 15, NE, NE; N, S; SE, SE; SE, SE; SE, SE; 20, SE, SE; S, SE; SW, S; SW, SE; SW, S; 25, S, SE; S, S; S, SW; SE, W; SE, NE; NW, N; W, SE. September 1, SE, SE; SE, SE; SE, SE; S, SE; 5, SE, S; NW, SE.

Third period, September 7 to October 13:

Movement.—The curve representing the total daily wind movement for this period shows four deep depressions, each time falling to 100 miles (on the 8th and 24th of September, 5th and 13th of October, respectively), and three decided elevations (on the 12th of September, 2d and 10th of October, with a total wind movement, respectively, of 298, 480, and 265 miles per diem). These general depressions and elevations present the more or less synchronous rough reverses of the general waves in the temperature curves for the same period. Each depression corresponds to rain except the last, the heaviest rainfall being coincident with the first; while, on the contrary, each elevation likewise corresponds to rain except the first, the second corresponding with the heaviest rain and storm during the encampment at Jacksonville, Fla. During the four times of deepest depressions the wind velocity averaged only a

little more than 4 miles per hour, while on the three days of highest elevation the velocity of the wind averaged, respectively, about 12, 20, and 11 miles per hour.

Direction.—Morning and evening in five-day periods: September 7, S, NE; SW, S; NE, NE; 10, NE, NE; NE, NE; NE, NE; N, NE; N, N; 15, N, NE; NE, NE; N, N; N, E; NE, NE; 20, NE, NE; NE, E; SE, SE; S, W; NW, S; 25, NE, NE; NE, NE; NE, NE; NE, NE; NE, NE; E, NE. October 1, N, N; NW, S; S, S; S, E; 5, E, SE; N, SE; N, NE; NE, NE; NE, NE; 10, NE, NE; NE, N; NW, E; N, NE.

Fourth period, October 13 to 31:

Movement.—The chief characteristic of the wind curve for this period is the frequent and considerable variations, indicating changes of 80 to 100 miles. The sharp elevations and depressions of the curve are separated by intervals of only two or three days. In truth, the general features of the wind curve resemble more or less closely and correspond inversely more or less synchronously with the sharp variations of temperature and humidity for the same period. Conversely to the first period, there is in this last period a manifest general average increase of the wind movement from the beginning to the end corresponding with a general decrease of the mean daily temperature. The average total daily wind movement for the period was about 188 miles, giving an average velocity of a little less than 8 miles per hour.

Direction.—Morning and evening in periods of five days: October 13, N, NE; S, NW; 15, NW, NE; NE, E; E, SE; NW, NW; NW, NE; 20, NE, E; S, S; W, W; W, NE; NE, NE; 25, NE, E; W, NW; N, N; NE, N; NE, NE; NW, NW; N, NE.

TYPHOID FEVER IN THE FIRST DIVISION, SEVENTH ARMY CORPS.

GENERAL REMARKS ON THE FIRST DIVISION CAMP AT MIAMI.

The selection of Miami as a camp for troops gave occasion for much criticism, and it was the general belief of the medical officers of the Seventh Corps that the water supplied the troops at this place was contaminated and was the cause of the large amount of sickness in the division encamped there.

On July 13 Lieutenant-Colonel Maus, chief medical officer of the Seventh Corps, went to Miami for the purpose of inspecting the camp. On his return to corps headquarters, at Jacksonville, he made a report to the Surgeon-General, from which the following quotations are taken:

The division (at Miami) consists of six regiments, First and Second Alabama, First and Second Texas, and First and Second Louisiana, and contains about 7,500 men. I was very much surprised to find such an unusually large percentage of sickness in this command. On the day of my arrival over 600 were on the sick report, besides almost that number suffering from various complaints, but not on sick re-

port. Many on this supplementary list were having dysentery and diarrhea, with from six to ten evacuations daily. The principal troubles consist of diarrhea and dysentery and malaria fevers, and there appears to be a universal opinion among officers and men that these diseases are due to the water supply. I made a careful inspection of the camp and found it otherwise in good sanitary condition. The regiments are located in piney groves adjacent to the city and on a coralline formation. The ground is not pleasant for camping purposes, because it is almost impossible to properly pitch the tents, and is very disagreeable for walking, as it cuts the shoes and is disagreeable for the feet when they are bare. The night soil is disposed of by being deposited in troughs partly filled with water. These troughs are connected with the sewers and are emptied and flushed frequently, but in some regiments the night soil is deposited in tubs, which are carted away and emptied into the sea. Pits are used at some regimental headquarters. The contents of these are covered from day to day.

The water supply is from two sources. The city of Miami is supplied with water taken from an open lake in the Everglades, about 4 miles distant. This water is piped to the city and distributed through the camp at convenient places. The other source is from driven wells, which penetrate the coralline formation for a distance of from 18 to 21 feet. The water comes from the wells turbid and contains a large amount of suspended matter, which deposits quickly on standing. It has a disagreeable taste and odor. I regard this water as unfit for use and believe it to be surface drainage. Many of the regimental officers have become so thoroughly convinced that this water is the chief cause of the prevailing illness that they have forbidden its use and have caused the handles to be removed from the pumps. The water from the Everglades is also turbid. It has a marshy taste and a decided odor. In my opinion, this water is probably productive of the malarial troubles. Thus the soldier stands, as it were, between two dangers—the well water, probably infected with typhoid, and the Everglade water, probably infected with the malarial poison. The Everglade water is much the warmer, and consequently the soldier prefers that from the wells. The lake in the Everglades collects the drainage of an extended territory covered with tropical vegetation and is filled with tall grass.

The division hospital is located on a vacant lot in the center of the town. The tents are crowded. The ground is low and covered with brush and other vegetation. The lot has been partially cleared, and some of the holes in it have been filled. One of these holes is about 30 feet in diameter and 6 feet deep. It seems to have been used as a deposit for rubbish. I expressed disapproval of this site and had a board appointed to select a suitable one outside of the city.

On the day of my arrival the hospital contained 269 cases, many of which were mumps, measles, intestinal troubles, and continued fevers. Only 8 of these continued fevers were diagnosed as typhoid, though they were continued and presented many of the symptoms of that disease, such as hebetude, iliac tenderness, gurgling, and, in some instances, rose-colored spots. These are unquestionably mild cases of typhoid fever. I believe that the Widal test should be made in all doubtful cases, and for this purpose I suggest that the hospital be supplied with pure cultures of the typhoid bacillus.

In a letter to the Adjutant-General Colonel Maus makes the following additional statement concerning the water:

Major Archinard, who has taken an active interest in this matter, had forwarded before my arrival samples of water for analysis to Tulane University. The following telegram has been received from him:

"The chemist, Doctor Metz, says well water is contaminated with sewage. It contains large amounts of free and albuminoid ammonia, nitrates, and nitrites. Everglade water contains much

vegetable matter. The bacteriologist, Dr. P. E. Archinard, states that a cursory examination shows both waters unfit for drinking purposes."

Colonel Wood, chief commissary of the Seventh Corps, under date of July 21, wrote concerning the water as follows:

To say nothing of the extremely high temperature of this water (the Everglade), owing to the direct action of the sun on the pipes, the water is about the color of that of the Missouri River and has a taste of vegetable matter that renders it unpleasant. To offset this, the troops have driven wells close to the company kitchens, and this water, while cooler, is daily contaminated by the slop and dish water thrown on the ground, to be pumped up again. To use either water seems to be the choice of two evils—malaria or typhoid fever—and I would earnestly recommend that the troops of the First Division be moved away from Miami, where the sick list is already amazingly large and daily increasing.

Colonel Guild, inspector-general of the Seventh Corps, writes of this water as follows, under date of July 19:

The main water supply comes from the swamp known as the Everglades. Samples tried by me had an offensive odor. The men universally believe it to be infected. This water is distributed through pipes lying on the surface of the ground, and consequently it is hot and unpalatable. Thus the men are encouraged to drink the cooler but infected water of the driven wells.

A medical board was convened by Colonel Maus for the purpose of ascertaining the cause of the great sickness in this division. This board consisted of Major Peeples, of the Second Texas; Major Pugh, of the Second Alabama, and Captain Blanchard, of the First Louisiana. These gentlemen agreed that the water was infected. A second board, consisting of Major Archinard, of the Second Louisiana; Major Vilas, of the First Texas, and Lieutenant Jackson, of the First Alabama, was requested to determine the nature of the continued fevers prevalent in this camp. After making one post-mortem examination and having a large number of samples of blood submitted to the Widal test, they concluded, July 20, that there were 50 instead of only 8 cases of typhoid fever in the division hospital.

It seems to have been unquestionably demonstrated that the water first supplied through the pipes as Everglade water was in reality pumped from a large shallow well, the situation of which rendered its contents quite as likely to be infected as was the water from the regimental wells. After the discovery of this deceit the Everglade water was furnished.

THE FIRST DIVISION CAMP AT JACKSONVILLE.

This camp site, which was occupied on August 5, was located on ground bordering on the west bank of the St. Johns River, near the suburb of Fairfield. The general elevation of the site was about 15 feet above the river and admitted of fair natural drainage, the ground sloping slightly from the river toward the shell

road. The soil consisted of sand which rapidly absorbed the rainfall. Shade trees were plentifully interspersed throughout the camp.

The water supply of this division was piped to the company streets from the deep artesian well of the Country Club at Fairfield.

For about two weeks after the arrival of the division from Miami, Fla., pits were dug along the shell road, in the rear of the regimental camp sites, for the reception of excreta and garbage. At the date of our inspection, August 28, 1898, a system of water carriage for excreta had been already instituted for the regiments of this division. Boxes lined with zinc, having a capacity of 20 feet by 18 by 20 inches, were provided. These were supplied with a constant stream of water and at intervals of about one hour were emptied into the sewer and thoroughly flushed out. The sewer pipes discharged into the St. Johns River. Provis on was made against overflow of these troughs.

At the time of our inspection, therefore, there was nothing objectionable either in the matter of the water supply or in the disposal of the excreta of these regiments.

FIRST DIVISION OF THE SEVENTH ARMY CORPS.

At the time of our inspection (August 28 to September 5, 1898) this division consisted of the following regiments: First Alabama, Second Alabama, First Louisiana, Second Louisiana, First Texas, Second Texas, Fourth United States Volunteers, and First Ohio.

The last two regiments mentioned, however, had been with this division only a few days, and it will be more satisfactory to consider the division as consisting of only six regiments, two from Alabama, two from Louisiana, and two from Texas.

A short sketch of the medical history of each of these six regiments will be attempted, and then we will endeavor to discuss points common to all of them.

Table showing for the regiments of the First Division of the Seventh Army Corps assembled at Jacksonville, Fla., the mortality and morbidity from typhoid fever.

Regiment.	Mean strength.	Certain and probable cases of typhoid fever.	Deaths from typhoid fever.	Deaths from all diseases.	Deaths from typhoid fever in 100 cases.	Percentage of deaths from typhoid to deaths from all diseases.	Morbidity of typhoid fever in 1,000 mean strength.	Deaths from typhoid fever in 1,000 mean strength.
First Alabama.....	1,178	158	10	16	6.32	62.50	134.12	8.48
Second Alabama.....	1,079	159	8	16	5.03	50.00	147.35	7.41
First Louisiana.....	1,224	269	11	16	4.08	68.75	219.77	7.98
Second Louisiana.....	1,102	177	8	15	4.51	53.33	160.61	7.25
First Texas.....	1,105	111	7	13	7.20	69.23	100.45	7.23
Second Texas.....	1,164	156	7	15	5.12	53.33	134.02	6.87
Total.....	6,852	1,030	53	91	5.14	58.24	150.32	7.73

FIRST ALABAMA VOLUNTEER INFANTRY.

At the time of our inspection Lieutenant Morris was the ranking medical officer of this regiment, and to his testimony we are largely indebted for the following facts concerning the history of the regiment. Lieutenant Morris was mustered in with the regiment and had remained with it until July 29, when he went home sick with typhoid fever and had returned to duty the day before his testimony was taken.

This regiment assembled with a full quota of men at Camp Clark, on Mobile Bay, on the 1st of May, 1898, and remained at this place until May 24. The only drinking water used at this camp was that of the city of Mobile. It was piped to the camp and has always been regarded as a perfectly safe drinking water. Pits for the reception of fecal matter were dug, and the kitchen refuse was placed in barrels, which were carted away and emptied by scavengers twice a day. Apparently the only thing about Camp Clark that seemed objectionable from a sanitary standpoint was an enormous quantity of logs washed in by the tide. These were decomposing and gave off a disagreeable odor. This mass of decaying vegetable matter was within from 100 to 150 feet of the nearest tents. During the first ten days at Camp Clark there was practically no sickness. About May 10 acute diarrhea appeared and soon affected a large number of the men. This was believed to be due to the change in diet from ordinary food to the army ration. About five days later tertian malaria, said to be of typical character, was observed and spread rapidly among the troops. During the three weeks of the stay at Camp Clark 2 cases of typhoid fever developed. These patients were sent to the marine hospital at Mobile, Ala.

We have not been able to get any official data concerning sickness at Camp Clark, and so far as these 2 typhoid fever cases are concerned Lieutenant Morris could only tell us that the men did not belong to the same company.

On May 25 this regiment was moved to Camp Coppinger, also near Mobile. (General Coppinger informs us that this camp was never given an official title and that he did not know that it had ever been called "Coppinger." However, it is convenient for us to use this term in order to distinguish this camp from Camp Clark, which was also near Mobile.) The city water had not been piped to the site occupied by this regiment at Camp Coppinger at the time of its arrival, but this was done three days later. During these three days the drinking water was taken from a creek which flowed along by the side of the regimental camp and through the general camp. There were no troops occupying sites farther up the creek. However, there may have been other sources of pollution for the water of this creek. This was the only doubtful drinking water used by the soldiers of this regiment at either Camp Coppinger or Camp Clark.

At Camp Coppinger the reported cases of malaria increased. From June 9 to 21, inclusive, 77 cases of malaria were reported. Of these, 61 were diagnosed as intermittent and 16 as remittent malaria. The distribution of these cases among the companies is interesting, and is as follows:

Company A.....	9	Company H.....	3
Company B.....	8	Company I.....	4
Company C.....	11	Company K.....	4
Company D.....	1	Company L.....	7
Company E.....	9	Company M.....	6
Company F.....	12		
Company G.....	3	Total.....	77

Concerning these cases of malaria, it is an interesting fact that 6 of the 9 from Company E reported ill on the same day and that 5 of the 6 from Company M reported ill on the same day. Indeed, the fact that two or more of the same companies reported sick on the same day is quite marked in many instances. It is possible that a full knowledge of the detail duty of the men would throw some light upon this observation, but in the absence of further information we can only call attention to this interesting fact. There is no record of the length of time that these patients continued on the sick list, and therefore we are wholly without data concerning the accuracy of the diagnosis.

According to the testimony of Major Vilas, who had charge of the division hospital, there were several small swamps within a few miles of Camp Coppinger, and the creek that flowed through the camp was a sluggish stream.

Lieutenant Morris stated that while the regiment was at Camp Coppinger 4 cases of typhoid fever developed. It will be seen from this that altogether 6 cases of typhoid fever appeared in this regiment while at the two camps near Mobile from June 1 to 21.

At Camp Coppinger pits of regulation size were used for both excrement and kitchen refuse. On account of want of space, these sinks were dangerously near the kitchens and mess tents, some of them being not more than 30 or 40 feet distant. Orders were issued that the contents of these pits should be covered with earth twice a day. Whether or not these orders were obeyed we have no means of determining. The diarrhea which had appeared at Camp Clark continued unabated in frequency but still mild in character at Camp Coppinger. Lieutenant Morris testified that at Camp Coppinger flies were numerous and pestiferous.

On June 21 this regiment left Camp Coppinger for Miami, Fla. At the latter place no preparation had been made for the regiment at the time of its arrival. Men were immediately detailed to dig sinks; but as the camp was located on a coralline formation covered by only a few inches of soil, the work of digging sinks proceeded very slowly. It was found that the excavations could be made only by blasting the rock with dynamite. In the meantime the men retired to the bushes, consisting of small palmettoes, immediately

adjoining the camp. When the pits had been finished they were found to be very imperfect, being not more than 3 feet deep. A pit for each company had been attempted, and the shallow trenches were screened by a framework of upright boards. The scarcity of soil rendered the proper covering of the contents of the pits well-nigh impossible, and after seven or eight days the odor from the pits became so offensive that some other method of disposing of fecal matter was deemed absolutely necessary. Finally the trough system, with water carriage to the sea, was introduced. The trough consisted of a wooden box lined with galvanized iron, made water-tight. Each box was from 12 to 16 feet long, about 2 feet broad, and 20 inches deep. One end of the trough was slightly elevated. Over the upper end there was placed a water tap, from which the trough could be filled. At the lower end there was an outlet, guarded by a hollow cylinder of galvanized iron, which when in position closed the outlet and terminated above a few inches below the top of the trough. This arrangement rendered overflow of the contents of the trough impossible unless the outlet or connected sewer should become clogged. The upper end of the cylindrical plug was furnished with a loop handle, by means of which the cylinder could be lifted and the contents of the trough allowed to flow away into the sewer. Three of these trough privies were constructed. A sentinel placed at each of these was instructed to see that the trough was emptied and filled with fresh water at specified intervals.

On the arrival of the regiment at Miami there had likewise been no provision for a supply of drinking water. For the first few days the soldiers visited the village and other sources of water supply without inquiry as to the character of that obtained. At first wells were bored within the regimental lines. Water was reached at the depth of about 12 feet. Lieutenant Morris stated that the water first obtained from these wells in his regiment was clear and palatable.

According to the statements of Lieutenant Morris, sickness of every kind decreased in this regiment during the first week after its arrival at Miami. This improvement in health, however, proved to be transitory. After a week or ten days the sick list took an upward curve and soon ran far beyond the highest mark reached at any time at Mobile. He thought that the most prevalent disease in the camp at this time was a malarial jaundice. This usually began with a chill and often was accompanied by nausea, vomiting, and sometimes by purging. These symptoms were followed by an intense icterus. Lieutenant Morris stated that about one-tenth of the command suffered from this form of illness. The disease evidently was an obstructive catarrhal jaundice. Only those most seriously affected were carried to the division hospital; all others were treated in quarters, and of these we have been unable to obtain any official record. We will therefore be compelled to content ourselves with the general statement already made.

The marked increase in the sick report quite naturally made the water of the shallow wells an object of suspicion, and it was decided to introduce the Everglade water that is supplied to the village of Miami. Water pipes were laid through the regimental streets and the handles were removed from the pumps of the shallow wells, and it was believed by officers and men that they were then being supplied with Everglade water.

Suspicion of the shallow-well water was strengthened by the fact that about the time of the epidemic of jaundice, heavy rains fell and the water in the shallow wells became turbid and of unpleasant odor and taste. The coralline formation at Miami is very porous, and surface filth could hardly fail to pollute the water of these shallow wells. Whether or not this pollution carried with it any specific infection can best be determined after we have attempted an analysis of the hospital records.

It must not be inferred that this epidemic of jaundice was the only sickness that afflicted this regiment while at Miami. Diarrheas were generally prevalent. As a rule the diarrhea was not grave, and only a small per cent of the cases reached the hospital. Dysentery was much less frequent and was seldom of grave character. There is no indication in the history of this regiment that the amoebic form of dysentery existed at any time. Fevers of short duration, generally reported as intermittent malaria, were common. The continued fevers, generally also reported as malarial, but in reality typhoid, will be studied more in detail later. Measles were epidemic at this time.

On August 10 this regiment was transferred to Jacksonville, Fla. Water was piped through the location before the arrival of the regiment. The character of the water supply at Jacksonville and a detailed statement of the general conditions existing at Jacksonville are given elsewhere.

In endeavoring to ascertain the number of cases of probable typhoid fever in this regiment we have been compelled to rely largely upon the records of the division hospital. In these records we find from the time of the enlistment of the regiment up to the middle of September 158 cases of probable typhoid fever. These cases may be tabulated according to the camp at which each occurred, as follows:

At Camp Clark May 21 to 24	2
At Camp Coppinger May 24 to June 21	28
At Miami June 21 to August 10	35
At Jacksonville August 10 to September 19	93

These cases are distributed among the companies as follows:

Company A	14	Company H	13
Company B	14	Company I	21
Company C	19	Company K	6
Company D	10	Company L	8
Company E	17	Company M	14
Company F	13		
Company G	7	Total	156

The 2 cases which occurred at Camp Clark are not given in the records, and therefore we have not been able to ascertain to which companies they belong. The fact that these cases are unevenly distributed among the companies leads us to the conclusion that at no time was the general water supply of this regiment contaminated. The first case for which we have the initial date occurred June 3. For the three days immediately following June 3 no cases are reported. From June 7 to 12, inclusive, 14 cases are given. From June 13 to 15, inclusive, there are no cases. From June 16 to 24, inclusive, there are 21 cases. From June 25 to 29, inclusive, there are no cases. From June 30 to August 2 there are 57 cases. From August 3 to 12, inclusive, there was only 1 case. From August 13 to 20, inclusive, there were 18 cases. From August 21 to 24, inclusive, there was only 1 case. From August 25 to September 3, inclusive, there were 17 cases. From September 4 to 5 there were no cases. From September 6 to 14, inclusive, there were 23 cases. After the last-mentioned date there were only 2 cases—one on September 17 and the other on September 19.

It should be borne in mind that our data concerning these cases have been obtained exclusively from the hospital records. We call attention to this because we do not believe that we have obtained records of all the cases of probable typhoid fever in this regiment. In determining whether or not we should place a given case in the list of probable typhoid fever we have had to depend largely upon the length of time the patient remained in the division hospital. It is a well-known fact that many men were frequently sick in quarters for many days before they were sent to the hospital. Army medical officers know that good soldiers often endeavor to keep off the sick list and delay reporting until some disease is in an advanced stage. In nearly every division hospital during the summer of 1898 one or more cases of death occurred from perforation of a typhoidal ulcer within from one to three days from admission to hospital. Furthermore, the First Division Hospital of the Seventh Army Corps—and this is equally true of many other division hospitals—was at times greatly crowded, and patients were sometimes discharged prematurely. Another source of error in determining from the hospital records the number of cases of probable typhoid fever in a regiment lies in the fact that commissioned officers were seldom sent to division hospitals. Sick officers easily secured furlough when unfit for duty and went home or to some city hospital. How many of the commissioned officers in the First Alabama had typhoid fever we have no means of determining. We have already mentioned that Lieutenant Morris had this disease, and yet his name does not occur in our list of probable cases because he did not go to the division hospital.

We mention these facts in order to show that the number of cases of typhoid fever in this regiment was probably larger by an unknown and undeterminable quantity than our figures indicate.

The diagnoses of the 158 cases of probable typhoid fever in this regiment were distributed as follows:

Typhoid fever.....	19
Diarrhea.....	45
Dysentery.....	7
Malaria.....	87
Total.....	158

It will be seen from the preceding history of the First Alabama that it began its service with some of its members infected with typhoid fever, and this infection manifested itself at Camp Clark and continued through the period covered by the encampments at Coppinger, Miami, and Jacksonville. The total number of cases, compared with those in some other regiments, is not large. There is no evidence that there was any typhoid infection of the general water supply of this regiment at any time. Had the water supply at any of these encampments been specifically infected with the typhoid bacillus, there should have been a more marked increase in the number of cases of the disease in this regiment, and the distribution of the disease throughout the companies should have been more uniform. In consideration of the well-known fact that the soldier drinks, when thirsty, from the first water obtainable, and that the regimental encampments were surrounded with shacks in which soft drinks from the most diverse sources were sold, the probabilities of occasional infection by drinking from these sources must be granted. It is worthy of remark that the typhoidal and diarrheal curves in this regiment are for the most part parallel. This fact strengthens the suspicion, already mentioned in connection with other regiments, that some of the diarrheas were, in fact, mild attacks of typhoid fever.

Contrary to the findings in our studies of the regiments of the First and Third Army Corps, it appears that in these regiments only about one-third of the cases of typhoid fever appeared for the first time on sick report when they were attacked with typhoid fever. In other words, about two-thirds of the men who had typhoid fever previously had what was diagnosed as malaria, diarrhea, or dysentery. However, in a large per cent of these cases we find, as we did in the Chickamauga regiments, that the preceding illness so closely preceded in point of time the typhoid fever that we are inclined to believe that it was a part of the typhoidal process.

The condensed sick reports for this regiment from June to August, inclusive, are as follows:

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	997
Diarrhea.....	89
Dysentery.....	52
Intermittent malaria.....	224
Remittent malaria.....	68
Other diseases.....	170
Total.....	603

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,215
Diarrhea.....	22
Dysentery	30
Intermittent malaria.....	187
Remittent malaria.....	14
Other diseases.....	208
Total	461

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,326
Diarrhea.....	3
Dysentery	16
Intermittent malaria.....	70
Remittent malaria.....	5
Other diseases.....	63
Total	157

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
1898.				
Finck, Philip N.....	Sgt., G.	Aug. 28	Jacksonville, Fla.....	Typhoid.
Franklin, William W.....	Pvt., M.	Oct. 1	Birmingham, Ala.....	Dysentery.
Gains, Nicholas P.....	Pvt., I.	June 27	Mobile, Ala.....	Typhoid.
Hannah, John W.....	Pvt., C.	June 23	Gadsden, Ala.....	Malarial fever.
Hart, George F.....	Capt., L.	Sept. 9	Jacksonville, Fla.....	Inflammation of bowels.
Horton, John F.....	Pvt., E.	Aug. 28	Miami, Fla.....	Typhoid.
McCullaugh, Robert J.....	Pvt., L.	June 27	Mobile, Ala.....	Dysentery.
Maloney, Frank J.....	Pvt., A.	Oct. 6	Birmingham, Ala.....	Apoplexy.
Noble, Samuel.....	Corpl., D.	Sept. 22	Anniston, Ala.....	Congestion of lungs, immediate cause being asthenia or heart failure.
Olsen, Olen.....	Pvt., I.	June 9	Mobile, Ala.....	Typhoid.
Pride, W. M., jr.....	Pvt., B.	Sept. 19	Florence, Ala., while on furlough.	Typhoid, complicating malaria.
Schitz, Charles.....	Pvt., K.	Aug. 18	Miami, Fla.....	Typhoid.
Sizemore, Fred W.....	do.	Oct. 3	Birmingham, Ala.....	Do.
Smith, V. Walter.....	Sgt., A.	July 15	Mobile, Ala.....	Enteric fever.
Stewart, James M.....	Pvt., A.	Aug. 23	Miami, Fla.....	Typhoid.
Thompson, Willie.....	Pvt., I.	Sept. 24	Opelika, Ala.....	

Total deaths.....	16
Deaths due to typhoid fever.....	10
Percentage of deaths among probable cases of typhoid fever (158), 6.32.	
Percentage of deaths among recognized cases of typhoid fever (19), 52.63.	

SECOND ALABAMA VOLUNTEER INFANTRY.

For the general medical history of this regiment we are indebted to Surg. Maj. S. S. Pugh.

The Second Alabama began to assemble at Camp Clark, on Mobile Bay, April 30, but was not mustered into the service of the United States until June 5. At Camp Clark the water supply was distributed through the regiments in pipes from Mobile. Pits were used for the disposal of fecal matter, and the garbage was deposited in barrels and carted away twice a day by scavengers. The first cases of typhoid fever appeared at Camp Clark. Company H of this regiment was recruited at Troy, Ala., at which place there was at the time of the enlistment of this company an epidemic of

typhoid fever. Major Pugh stated that Company H reached Camp Clark about the middle of May and that within two weeks 3 of the men of this company were sick with typhoid fever. About the middle of June this regiment was moved to Camp Coppinger, and about the last of the same month it was transferred to Miami, Fla. While at Camp Coppinger, according to Major Pugh, 3 additional cases of typhoid fever occurred in Company H. This makes 6 cases in this company while at Camp Clark and Coppinger. The hospital records show only 1 of these cases.

At Camp Coppinger the water supply had already been provided for this regiment before its arrival. The water, like that at Camp Clark, was brought from the city of Mobile, and there seems to be no cause for any suspicion of this water. It is spring water brought to the city from a distance of 14 miles, and the testimony of the health authorities of the city and of the military medical officers of the post, extending through many years, is that this water is perfectly safe. Major Pugh stated that he practiced medicine for some years in Mobile and that he had never seen a case of typhoid fever that originated in the city. At Camp Coppinger company sinks were used for the reception of excrement.

As has been stated, this regiment arrived at Miami, Fla., June 30, 1898. It was there brigaded with the Second Louisiana and the Second Texas. The attempt to utilize sinks failed on account of the coralline formation, and the location of the regiment was such that the trough system employed in the First Brigade could not be used. Galvanized-iron tubs were used for the reception of the fecal matter and urine. These tubs were not always properly cared for, and the soil about them became quite polluted.

Flies and mosquitoes were very numerous at this camp. In fact, it is stated that the mosquitoes were so numerous and fierce that for a while men could sleep only when a detail protected them from this vile pest.

The history of the water supply at Miami is the same as that already given for the First Alabama. On the arrival of this regiment no provision for water had been made. For the first day or two the men visited the village houses nearest the camp. After wells were bored to a depth of about 12 feet an abundance of questionable water was obtained. About ten days after the arrival of the regiment heavy rains fell, and the water of the shallow wells became so perceptibly polluted that its further use was forbidden and the handles were removed from the pumps. Later, water said to be from the Everglades was piped through this regiment.

Diarrhea and catarrhal jaundice became very prevalent in this regiment, as they did in all others of this division while encamped at Miami.

From the hospital records we have obtained a list of 158 cases of probable typhoid fever in this regiment. It may be worth noting that this number is exactly the

same as that of the probable typhoid fever cases in the First Alabama Volunteer Infantry.

These cases are distributed among the companies as follows:

Company A	13	Company I	14
Company B.....	11	Company K	18
Company C.....	17	Company L.....	4
Company D	5	Company M.....	9
Company E.....	21	Without company.....	2
Company F.....	11		
Company G	10	Total.....	158
Company H	23		

As has been stated, the first 6 cases occurred in Company H. June 21, 3 cases are reported; 2 of these were from Company G and 1 from Company L. The next cases reported occurred June 23 and came from Company E. On June 26, 3 cases were reported, 2 from Company H and 1 from Company G. The next cases occurred June 27 and came from Company F. There were no more cases until July 1, when 3 cases occurred, 1 from E, 1 from F, and 1 whose company is not given. On July 2, 12 cases were reported; of these A furnished 3, F, H, and I, 2 each, and D, E, and G, 1 each.

The hospital diagnoses of the probable cases are as follows:

Typhoid fever.....	31
Diarrhea.....	60
Dysentery	4
Malaria.....	63
Total	158

As may be seen, this regiment went into service with one company badly infected with typhoid fever. For the first month this disease was confined to this company, and up to September 30 this company had the largest number of cases of typhoid fever. However, another company nearly equaled it. It is also noteworthy that Company H led all the companies in the total number of hospital cases. The history of this regiment illustrates a fact that we have frequently mentioned in our statements concerning other military organizations. Some of the members of Company H went to Camp Clark infected with typhoid fever. The regiment was moved successively to Camp Coppinger, Miami, and Jacksonville, and yet typhoid fever continued in its ranks. The removal of an infected body of men from one location to another may possibly diminish the number of cases of typhoid fever, but ordinarily it is not sufficient to stamp out the disease. This holds good when there is no infection of the drinking water. A body of soldiers infected with typhoid fever may carry the infection with it even when the sick are left behind. When this company left Mobile all those sick with typhoid fever remained at that place. It reached Miami June 30, and those who became sick early in July were probably infected at Mobile, but the infection continued to manifest itself through July,

August, and September. Again, when this regiment was moved from Miami to Jacksonville all the sick were left behind, and yet the men carried typhoid fever with them to Jacksonville. It seems to us that the experience of our military organizations in 1898 has most positively demonstrated that the typhoid fever infection may be carried in clothing, in bedding, and in tentage.

The history of this regiment, like that of the First Alabama, gives no support to the supposition that the drinking water supply at Miami or at any of the camps was specifically infected with typhoid fever.

The condensed sick reports for this regiment are as follows:

CONDENSED SICK REPORT FROM JUNE 14 TO 30, INCLUSIVE.

Mean strength	987
Diarrhea.....	26
Dysentery	11
Intermittent malaria.....	17
Remittent malaria.....	2
Other diseases.....	44
Total	100

This regiment was encamped near Mobile, Ala., from June 14 to 27. It was en route to Miami, Fla., from June 27 to 30.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,236
Diarrhea.....	34
Dysentery	31
Intermittent malaria.....	108
Remittent malaria.....	28
Other diseases.....	103
Total	304

This regiment was encamped during the whole of the month of July at Miami, F.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,206
Diarrhea.....	88
Dysentery	12
Intermittent malaria.....	104
Remittent malaria.....	9
Other diseases.....	235
Total	448

In the month of August this regiment was at Miami, Fla., from the 1st to the 4th. It reached Jacksonville August 5. Much of the sickness of this month is supposed to have been contracted at Miami.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	889
Diarrhea.....	6
Dysentery	4
Intermittent malaria.....	39
Remittent malaria.....	1
Other diseases.....	91
Total	141

This regiment remained in camp at Jacksonville until September 19, when it was given thirty days' furlough. Company K remained at Jacksonville to guard property.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Alston, Robert N	Pvt., G.	July 24	.....	Typhoid.
Black, Joseph F.	Pvt., F.	Aug. 24	Camp Cuba Libre.....	Do.
Cox, Harmon	Pvt., C.	Sept. 10	Jacksonville, Fla.	Clot of blood on brain.
Gold, Solomon W.	Pvt., I.	Aug. 21	Larkinsville, Ala.	Typhoid.
Herrin, Columbus M. ..	Pvt., E.	Sept. 7	Jacksonville, Fla.	Dysentery.
Hicks, James M. P.	Pvt., I.	Sept. 18	do	Typhoid.
James, Elvin E.	Pvt., B.	Aug. 26	do	Dysenteric fever.
Lequire, James C.	Pvt., I.	Oct. 21	Tupelo, Miss. ....	.....
McCutchen, Harvey B ..	Pvt., I.	Aug. 17	Miami, Fla.	Typhoid.
Murphy, W. J.	Pvt., B.	Oct. 21	Montgomery, Ala.	Acute alcoholism.
Rollins, W. E.	Pvt., G.	Aug. 19	Jacksonville, Fla.	Typhoid.
Sammerefer, A. F.	Pvt., B.	Aug. 23	do	Do.
Simmons, Lennie P.	Pvt., A.	Aug. 14	Miami, Fla.	Chronic dysentery.
Wells, Alonzo E.	Pvt., D.	Oct. 6	Montgomery, Ala.	Typhoid.
Whately, Martin T.	Pvt., C.	Oct. 5	Winn, Ala.	Pneumonia.
Yawn, George	Pvt., G.	Sept. 28	Graceville, Fla.	Congestion of brain.

Total deaths..... 16

Deaths from typhoid fever..... 8

Percentage of deaths among probable cases of typhoid fever (159), 5.03.

Percentage of deaths among recognized cases of typhoid fever (31), 25.8.

It is more than probable that several other deaths in the above list were actually due to typhoid fever.

FIRST LOUISIANA VOLUNTEER INFANTRY.

First Brigade, First Division, Seventh Army Corps.

Maj. Frank E. Artaud, surgeon of this regiment, furnished us with the following facts pertaining to its medical history: The regiment began to assemble at New Orleans, La., about May 1. It was recruited principally from New Orleans, Shreveport, Lake Charles, and Iberia. The encampment was on the fair grounds, and the city water (from the Mississippi River) was piped through the camp. For about twenty days the men occupied a large building. Fecal matter was deposited in sinks, sprinkled with lime two or three times a day, and covered with earth once a day. There were many cases of diarrhea, 1 of dysentery, and 1 of pneumonia while at this camp. Major Artaud attributed the diarrhea to imperfect cooking of food, the eating of unripe fruit, and the action of the river water on men unaccustomed to it. He stated that the water when drawn from the hydrant was quite muddy from suspended matter, which deposited on standing. The water used at the regimental hospital was boiled, but that used generally in the command was not boiled. There was no typhoid fever in the regiment while at New Orleans.

About June 5 this regiment reached the camp near Mobile, which we have designated as Camp Coppinger. This camp was located on Spring Hill, about 8 miles from the center of the city of Mobile, and on ground covered with pines. The water at first used by this regiment while at Camp Coppinger was taken from a

creek which, in Major Artaud's opinion, may have been contaminated from the sinks, which overflowed after heavy rains. Moreover, other regiments were located on this stream above the camp of the First Louisiana, and men defecated in the woods along the banks. Heavy rains fell while the regiment was in this camp. Six regiments were placed on the stream above the First Louisiana. While at this place the list of the sick rapidly increased. The sickness consisted principally of diarrhea and intermittent and remittent fevers. Major Artand stated that three cases of typhoid fever developed in this regiment while occupying this site. He gave the date of the first case as about ten days after the arrival of the regiment from New Orleans. He also gave us the name of the individual soldier who was the first to have typhoid fever, but we have failed to find this name on any of the hospital reports. Diarrhea and dysentery became very prevalent. Major Artaud thinks that the typhoid fever at Mobile was due to contamination of the drinking water. Two of the 3 cases of typhoid fever occurred among members of Company I.

This regiment left Mobile June 21 and reached Miami, Fla., June 23. Here the water supply was the same as that of the regiments whose histories have already been given. The wells put down in this regiment were about 18 feet deep. Major Artaud stated that the men washed in the water to-day, threw it upon the ground, and pumped it up and drank it to-morrow. Sinks were first used for fecal matter, and later the trough system was introduced.

Fevers of undetermined type became very prevalent, and diarrhea also increased. Major Artaud was of the opinion that the first case of typhoid fever developed at Miami about three weeks after the arrival of the regiment at that place, but the hospital records show 3 cases admitted July 2, and, as has been stated, the regiment reached Miami June 23.

The company commanders were instructed to have the men use only boiled water, but this was carried out only imperfectly, owing largely to want of suitable vessels in which a quantity of water sufficiently large could be boiled. Besides, there was no provision for cooling and aerating the boiled water. Major Artaud made to us the following statement concerning the condition of the men at Miami:

The men were compelled to drill at the wrong time of the day, and the regimental drills were too severe. They were compelled to start at 8 o'clock in the morning and walk nearly 3 miles over stones and palmettoes which cut their shoes. Near the drill ground was a small ravine of stagnant water, from which the soldiers would fill their canteens. They would return to camp about 12 o'clock tired and hot. Here they were met by vendors of ice cream, and they went to the canteen and drank cold beer and ate unripe pineapples and coconuts. Their feet were often wet, and many did not have a change of socks.

This regiment reached Jacksonville, Fla., August 10. Artesian water was piped through the location before

the arrival of the regiment. The trough system for the disposal of fecal matter was used here also.

It is quite difficult to come to any definite conclusion concerning the number of probable cases of typhoid fever in this regiment. The records of the division hospital show the following admissions from this regiment:

Typhoid fever.....	31
Continued malaria.....	22
Intermittent malaria.....	86
Diarrhea.....	118
Dysentery.....	12
Total.....	269

Many of these were kept in hospital only a short time and were sent to a convalescent hospital at Pablo Beach. For this reason we are quite unprepared to determine how many of the 269 hospital cases were actually typhoid fever. The hospital cases were distributed among the companies as follows:

Company A.....	10	Company H.....	27
Company B.....	26	Company I.....	22
Company C.....	19	Company K.....	6
Company D.....	36	Company L.....	19
Company E.....	28	Company M.....	12
Company F.....	35		
Company G.....	29	Total.....	269

The unequal distribution among the companies is, as will be seen from the above, very evident. Company K did not have a case of recognized typhoid fever or one of continued malaria. The hospital cases from this company consisted of 2 diagnosed as "intermittent malaria," 3 diagnosed as "diarrhea," and 1 diagnosed as "dysentery."

The condensed sick reports for this regiment for June, July, and August are as follows:

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,096
Diarrhea.....	10
Dysentery.....	1
Intermittent malaria.....	7
Remittent malaria.....	3
Other diseases.....	80
Total.....	101

This regiment was in camp near Mobile, Ala., until June 21; it was en route from Mobile to Miami, Fla., from June 21 to June 23. The prevailing disease during this month was measles.

CONDENSED SICK REPORT FOR JULY.

Mean strength.....	1,237
Diarrhea.....	47
Dysentery.....	31
Intermittent malaria.....	152
Remittent malaria.....	23
Other diseases.....	228
Total.....	481

This regiment was in camp during the month of July at Miami, Fla. The prevailing diseases were measles, mumps, and intermittent malaria.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength.....	1,212
Diarrhea.....	30
Dysentery.....	7
Intermittent malaria.....	108
Remittent malaria.....	25
Other diseases.....	77
Total.....	247

This regiment left Miami August 11 and reached Jacksonville August 12, where it remained in camp during the rest of the month.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Baltzell, Met.....	Pvt., H.	1898. Aug. 20	Jacksonville, Fla.....	Inflammation of bowels.
Daniel, R. A.....	Pvt., A.	Aug. 5	Miami, Fla.....	Measles, complicated with Bright's disease.
Gann, William A.....	Pvt., L.	Sept. 20	Jacksonville, Fla.....	Typhoid.
Goff, James N.....	Q. m. sgt., F.	Oct. 2	.....do.....	Do.
Holland, William M.....	2d lt., F.	Aug. 31	.....do.....	Do.
Joffrion, Marion, jr.....	Pvt., E.	Nov. 11	Camp Cuba Libre, Fla.....	Do.
Kirk, Wiltz M.....	Pvt., B.	Aug. 18	Miami, Fla.....	Do.
Lafasco, Rosene.....	Pvt., K.	Sept. 21	New Orleans, La.....	Do.
Lanier, William F.....	Pvt., H.	June 10	.....do.....	Do.
Lee, T. Wood.....	Capt., E.	Sept. 12	Monroe, La.....	Measles, complicated with dysentery.
Miller, Scott M.....	Pvt., G.	July 18	Miami, Fla.....	Do.
Penninger, Silas C.....	Pvt., I.	Aug. 7	.....do.....	Measles.
Scott, E. A.....	Lt., E.	Sept. 16	Jacksonville, Fla.....	Typhoid.
Sneed, Gordon L.....	2d lt., A.	July 24	Miami, Fla.....	Do.
Villarnabo, O. S.....	Art., K.	July 9	.....do.....	Dysentery.
Wainright, James M.....	Pvt., F.	Aug. 22	Division hospital.....	Do.

Total deaths.....	16
Deaths from typhoid fever.....	11
Percentage of deaths among cases of protracted fever (269), 4.08.	
Percentage of deaths among recognized cases of typhoid fever (31), 35.49.	

SECOND LOUISIANA VOLUNTEER INFANTRY.

Second Brigade, First Division, Seventh Army Corps.

We are indebted to Captain Rainnold, assistant surgeon, U. S. Volunteers, for a brief statement of the medical history of this regiment. The Second Louisiana Volunteer Infantry assembled at the fair grounds at New Orleans, May 2, and remained at that place until May 29. At first river water was used, but, diarrhea becoming prevalent and being attributed to the water, distilled water was obtained. On making this change the diarrhea largely disappeared. On May 29 this regiment went to Mobile, Ala. Here it was first encamped beyond the water supply, and the men were compelled to take their drinking water from the creek. Later the regiment was moved onto a site that had been vacated by a regiment of regulars and over which the water pipes extended. Captain Rainnold believes that the two cases of typhoid fever developed at Mobile were due to infected water.

This regiment reached Miami, Fla., June 29. The water supply at this place was the same as that of the other regiments of this division, and tubs were used for the disposal of fecal matter. Eight cases of recognized typhoid fever developed within ten days after the arrival of the regiment at Miami, and 27 cases during the month of July, 21 of these occurring within the first three weeks of this month. It is doubtful if all of these were infected at Mobile. Whatever the source, there can be no doubt that this regiment became quite seriously infected with typhoid fever at Mobile, and there is no indication that the water supply at Miami was specifically infected with typhoid fever. Had this been true, the number of cases of typhoid fever should have markedly increased during the latter half of July and the first of August.

However, Captain Rainnold states that during the last ten days of their stay at Miami all the drinking water was boiled, and to this he attributes the decrease in the number of cases of typhoid fever. We can not question the wisdom of having the drinking water boiled. The supply of water at Miami was undoubtedly bad, but was it specifically contaminated with typhoid fever? We believe that had more than 1,200 men been drinking for the first twenty days of July a water infected with typhoid fever germs, there would have been some marked increase in the disease during the latter half of the month, notwithstanding the fact that these men were then drinking sterilized water.

This regiment was removed to Jacksonville, Fla., about August 8. Here it had artesian water distributed in pipes, and the privies consisted of water troughs, connected with sewers, discharging into the St. Johns River.

The cases sent from this regiment to the division hospital were classified as follows:

Recognized typhoid fever.....	22
Continued malaria.....	21
Intermittent malaria.....	46
Diarrhea.....	66
Dysentery.....	22
Total.....	177

These were distributed among the companies as follows:

Company A.....	13	Company H.....	24
Company B.....	9	Company I.....	11
Company C.....	13	Company K.....	13
Company D.....	8	Company L.....	21
Company E.....	11	Company M.....	17
Company F.....	18		
Company G.....	19	Total.....	177

We have been able to obtain only two monthly sick reports from this regiment. These are as follows:

H. Doc. 757, 58-2—34

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,064
Diarrhea.....	58
Dysentery.....	14
Intermittent malaria.....	19
Remittent malaria.....	9
Other diseases.....	88
Total.....	188

From May 26 to 31 no sickness was reported in this regiment. It was in camp near Mobile, Ala., until June 26, when it left for Miami, Fla., reaching the latter place June 29.

CONDENSED SICK REPORT FOR JULY.

Mean strength.....	1,140
Diarrhea.....	46
Dysentery.....	22
Intermittent malaria.....	25
Remittent malaria.....	7
Other diseases.....	65
Awaiting diagnosis at the end of the month.....	74
Total.....	239

This regiment was encamped at Miami, Fla., during the month of July.

The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Burrows, Ernest O.....	Pvt., H.	1898, Sept. 8	Pablo Beach, Fla.....	Typhoid.
Davis, Joshua.....	Pvt., C.	Aug. 15	Miami, Fla.....	Appendicitis.
Dufour, Elmer G.....	Capt., I.	Nov. 12	New Orleans, La.....	Abscess resulting from pneumonia.
Hicks, James M.....	Pvt., I.	Sept. 18	Jacksonville, Fla.....	Typhoid.
Lasch, Albert.....	Pvt., H.	Sept. 13	do.....	Chronic dysentery.
Lasserre, Ernest J.....	Pvt., M.	Aug. 7	Miami, Fla.....	Abscess on liver.
McClure, S. B.....	2d lt., K.	Oct. 17	Jacksonville, Fla.....	Typhoid.
Mugnier, A. L.....	Mus., H.	July 18	Miami, Fla.....	do.
Muldoon, Barney.....	Pvt., H.	Aug. 4	do.....	Dysentery.
Nelson, John D.....	1st lt., K.	July 19	do.....	Typhoid.
Parker, Archie W.....	Corpl., H.	Aug. 14	Jacksonville, Fla.....	Bilious dysentery.
Seidler, John P.....	Pvt., D.	Oct. 12	do.....	Typhoid.
Sharp, Louis.....	Corpl., C.	1899, Apr. 16	Savannah, Ga.....	Typhoid and intestinal hemorrhage.
Waterman, Wm. G.....	Pvt., E.	Mar. 27	do.....	Disease.
Wood, Edmond S.....	Pvt., E.	1898, July 23	Miami, Fla.....	Typhoid.

Total deaths.....	15
Deaths from typhoid fever.....	8
Percentage of deaths among probable cases of typhoid fever (177), 4.52.	
Percentage of deaths among recognized cases of typhoid fever (22), 36.36.	

FIRST TEXAS VOLUNTEER INFANTRY.

We are indebted to Capt. William Gammon of this regiment for the following facts pertaining to its medical history:

This regiment assembled at Austin, Tex., May 3, and was mustered into the service of the United States soon

thereafter. It remained at Austin until May 19, when it departed for Mobile, Ala. While at Austin there was but little sickness; some diarrhea, but nothing serious. However, there was opportunity for typhoid infection at Austin within the regiment. One man who was with the regiment for about one week, but who was not enlisted, was taken ill while at Austin, went home, and died a few weeks later of typhoid fever.

On May 21 this regiment reached Mobile, Ala., and joined other troops at Camp Coppinger. While here 2 cases of typhoid fever developed and were left when the regiment was sent to Miami, the last of June. One of these, a private of Company M, died.

On the way from Mobile to Miami 2 men sickened with typhoid fever. On the hospital record the date of the illness of these 2 men is given as July 1, but in fact, as has been stated, they become ill in transit on June 28.

The water supply and other conditions of camp life at Miami were much the same as those of the two Alabama regiments. This regiment had no sewer connection, and the feces were deposited in sinks, and some of the men used floating privies. From the regimental and hospital records we have obtained a list of 111 cases of probable typhoid fever in this regiment from the time of its enlistment to the 31st of October. These are distributed among the companies as follows:

Company A.....	9	Company I.....	12
Company B.....	4	Company K.....	6
Company C.....	3	Company L.....	13
Company D.....	5	Company M.....	17
Company E.....	15	Without company.....	1
Company F.....	7		
Company G.....	8	Total.....	111
Company H.....	11		

The unequal distribution of this disease among the companies is again evident in these figures, and to us it adds to the proof that the general water supply was not at any time infected with typhoid fever.

These probable cases were diagnosed as follows:

Typhoid fever.....	50
Diarrhea.....	11
Dysentery.....	4
Malaria.....	46
Total.....	111

Condensed sick reports for this regiment are as follows:

CONDENSED SICK REPORT FOR MAY.

Mean strength.....	1,012
Diarrhea.....	59
Dysentery.....	1
Intermittent malaria.....	14
Other diseases.....	90
Total.....	164

The regiment left Austin, Tex., May 19, and reached camp near Mobile, Ala., May 21. Three sick men were left in hospital at Austin.

CONDENSED SICK REPORT FOR JUNE.

Mean strength.....	1,027
Diarrhea.....	128
Intermittent malaria.....	22
Remittent malaria.....	2
Other diseases.....	181
Total.....	333

This regiment left Mobile June 22 and arrived at Miami, Fla., June 24. The prevailing diseases during this month were measles, mumps, diarrhea, and malarial fevers.

CONDENSED SICK REPORT FOR JULY.

Mean strength.....	1,287
Diarrhea.....	245
Dysentery.....	9
Intermittent malaria.....	92
Remittent malaria.....	9
Other diseases.....	546
Total.....	901

The regiment was encamped during the entire month of July at Miami, Fla. "The prevailing diseases during the month were diarrhea, measles, mumps, coryza, typhoid fever, and a few cases of malaria."

Again we call attention to the fact that the surgeon in his comments recognized the presence of typhoid fever, but does not record these diseases in his monthly sick report.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength.....	1,277
Diarrhea.....	93
Dysentery.....	2
Intermittent malaria.....	45
Remittent malaria.....	17
Other diseases.....	173
Total.....	330

The regiment left Miami, Fla., August 8 and reached Jacksonville August 9.

The prevailing diseases for this month were malaria, typhoid fever, and diarrhea.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength.....	1,192
Diarrhea.....	6
Dysentery.....	8
Intermittent malaria.....	37
Remittent malaria.....	44
Other diseases.....	34
Total.....	129

The regiment remained in camp at Jacksonville during the month of September. Undoubtedly many of the cases reported as remittent malaria were actually typhoid fever.

The following is an alphabetical list of total deaths in this regiment, so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Ashley, Alt. A	Pvt., I.	1898, Aug. 18	Camp Cuba Libre, Fla.	Typhoid.
Baughman, T. M.	Pvt., H.	Oct. 22	Jacksonville, Fla.	Do.
Chambers, Chromer J.	Pvt., E.	1899, Jan. 17	Fort McPherson, Ga.	Cerebro-spinal meningitis.
English, Chas. H.	Band.	1898, Oct. 30	Jacksonville, Fla.	Typhoid.
Leslie, C. W.	Pvt., M.	June 24	Near Mobile, Ala.	Do.
Long, Michael N.	Pvt., B.	Dec. 15	Galveston, Tex.	Do.
McLanahan, W. C.	Pvt., K.	Sept. 25	Jacksonville, Fla.	Do.
Mai, Gus.	Pvt., D.	Apr. 27	Josiah Simpson General Hospital, near Fort Monroe, Va.	Pyemia following operation for appendicitis.
Proctor, Geo. A.	Pvt., L.	Sept. 23	Jacksonville, Fla.	Dysentery, ulcerated.
Reid, William E.	Mus., I.	Oct. 1	do	Typhoid.
Rielly, C. L.	Pvt., F.	Sept. 23	do	Heart failure under influence of chloroform before operation.
Starker, Julius F.	Corpl., L.	Oct. 12	Camp Cuba Libre, Fla.	Typhoid.
Tatum, Neal G.	Pvt., G.	July 12	Miami, Fla.	Inflammation of bowels.

Total deaths.....	13
Deaths from typhoid fever.....	8
Percentage of deaths among probable cases of typhoid fever (111), 7.2.	
Percentage of deaths among recognized cases of typhoid fever (50), 16.	

SECOND TEXAS VOLUNTEER INFANTRY.

We are indebted to the surgeon of this regiment, Maj. S. F. Peeples, for the medical history from which the following statements have been condensed.

This regiment assembled at Austin, Tex., about May 7. The surgeon reported only 2 cases of illness at this place—1 as mumps and 1 as measles. There is no evidence that typhoid-fever infection was introduced into this regiment at Austin. May 20 the regiment started for Mobile, Ala., and reached that place May 23. Major Peeples is quite confident that while at Camp Coppinger the regiment remained uninfected with typhoid fever. In truth, there is no direct evidence that typhoid fever developed in this regiment while at Mobile. On leaving for Miami, Fla., 9 members of this regiment were sent to the marine hospital at Mobile. Under date of September 6, 1898, Acting Assistant Surgeon Duggan, of this hospital, reported all of these cases as completed. Four were cases of measles, 3 of mumps, 1 of tetanus (the only death), and 1 of acute diarrhea. The only possible typhoid in this list is the last mentioned. This man, a private from Company D, was sent to the division hospital, after being sick in quarters for some days, on June 22. Here his case was diagnosed as malaria. On June 24 he was transferred to the marine hospital, where he remained until discharged, July 12. As has been stated, this case was diagnosed at the marine hospital as "acute diarrhea." This may have been a case of typhoid fever, but on this point we have no further knowledge than that herewith given. That the Second Texas did become infected at Camp Coppinger with typhoid fever is, however, rendered quite certain by the development of that disease immediately after

arrival of the regiment at Miami—i. e., within the usual period of incubation.

The water supply at Camp Coppinger was that of the city of Mobile, piped through the regiment. The contents of the sinks were believed to be covered three times a day with earth. The regiment left Mobile for Miami, Fla., June 26, and arrived June 28. On July 1 a case of typhoid fever was sent to the division hospital, and several others followed within the next three days. It is quite certain that these men were infected before they left Mobile.

The water supply at Miami was the same as that of the other regiments of this division. For the disposal of fecal matter, pits were first tried. These could be made only a few inches deep and soon became exceedingly foul. Galvanized-iron tubs were next used.

After reaching Miami the total sickness rapidly increased, until nearly half of the regiment was on the sick report. Undetermined fevers, diarrhea, dysentery, and bronchitis made up the majority of these cases. During the month of July the number of undetermined fevers in this regiment reached 250.

This regiment left Miami for Jacksonville, Fla., August 6. At Jacksonville it was supplied with artesian water, and the trough system carried fecal matter into the St. Johns River.

Our list of cases of probable typhoid fever in this regiment number 186. These are distributed among the companies as follows:

Company A.....	21	Company H.....	13
Company B.....	21	Company I.....	20
Company C.....	14	Company K.....	4
Company D.....	17	Company L.....	12
Company E.....	20	Company M.....	12
Company F.....	11		
Company G.....	21	Total.....	186

Again, we are struck with the unequal distribution of typhoid fever among the companies. For instance, Company K has only one-fifth the number found in Companies A, B, E, G, and I.

In regard to diagnosis these cases are distributed as follows:

Typhoid fever.....	23
Continued malaria.....	31
Intermittent malaria.....	56
Diarrhea.....	74
Dysentery.....	2
Total.....	186

Condensed sick reports for this regiment are as follows:

CONDENSED SICK REPORT FROM MAY 23 TO 31, INCLUSIVE.

Mean strength.....	1,012
Diarrhea.....	24
Dysentery.....	9
Intermittent malaria.....	26
Other diseases.....	24
Total.....	83

On May 20 this regiment left Austin, Tex., for Mobile, Ala. This record was not begun until after reaching Mobile.

CONDENSED SICK REPORT FOR JUNE.

Mean strength	1,021
Diarrhea	96
Dysentery	19
Intermittent malaria	159
Other diseases	90
Total	364

This regiment remained at Mobile until June 25. It reached Miami, Fla., June 28.

CONDENSED SICK REPORT FOR JULY.

Mean strength	1,253
Diarrhea	87
Dysentery	31
Intermittent malaria	278
Other diseases	222
Total	618

The regiment was encamped at Miami during the whole of the month of July.

CONDENSED SICK REPORT FOR AUGUST.

Mean strength	1,310
Diarrhea	51
Dysentery	22
Intermittent malaria	160
Other diseases	145
Total	378

The regiment left Miami August 6 and reached Jacksonville August 8.

CONDENSED SICK REPORT FOR SEPTEMBER.

Mean strength	1,225
Diarrhea	5
Dysentery	6
Intermittent malaria	57
Other diseases	63
Total	131

The regiment remained in camp at Jacksonville until September 20. It was en route from Jacksonville to Dallas, Tex., from September 20 to 24. It was disbanded on furlough at Dallas September 28.

Five cases of typhoid fever developed in this regiment after it left Jacksonville and before it was disbanded.

The following is an alphabetical list of total deaths in this regiment so far as we have been able to ascertain:

Name.	Rank and company.	Date.	Place of death.	Cause of death.
Bean, William	Corpl., A.	1898. Aug. 13	Miami, Fla.	Typhoid.
Bell, John	Pvt., A.	Sept. 13	Camp Cuba Libre, Fla.	Pulmonary phthisis.
Caver, Lee	Pvt., E.	Oct. 21	Dallas, Tex.	Peritonitis, caused by appendicitis.
Hawkins, John H.	Pvt., H.	Oct. 7	Jacksonville, Fla.	Typhoid.
Heath, Marcus	Pvt., E.	Aug. 3	Miami, Fla.	Do.
Perring, Carlos W.	Pvt., F.	Aug. 11	do.	Do.
Kirby, Joseph T.	Pvt., D.	July 13	do.	Suppurative appendicitis.
McClure, Cornelius E.	Pvt., F.	June 30	Mobile, Ala.	Tetanus.
Payne, W. D.	Sgt., H.	Aug. 24	do.	Apoplexy.
Pickett, Sidney R.	Pvt., A.	Sept. 29	Jacksonville, Fla.	Typhoid.
Rogers, Zeb V.	Pvt., A.	July 28	Miami, Fla.	M e a s l e s, complicated by dysentery.
Siddall, Vene P.	Mus., E.	Aug. 9	do.	Dysentery.
Towell, George F.	Pvt., B.	July 24	do.	Typhoid.
Von Schluenboch, A.	Pvt., F.	Nov. 2	Waco, Tex.	Do.
Williams, N.	Pvt., F.	Oct. 2	Dallas, Tex.	Typhoid, malarial.

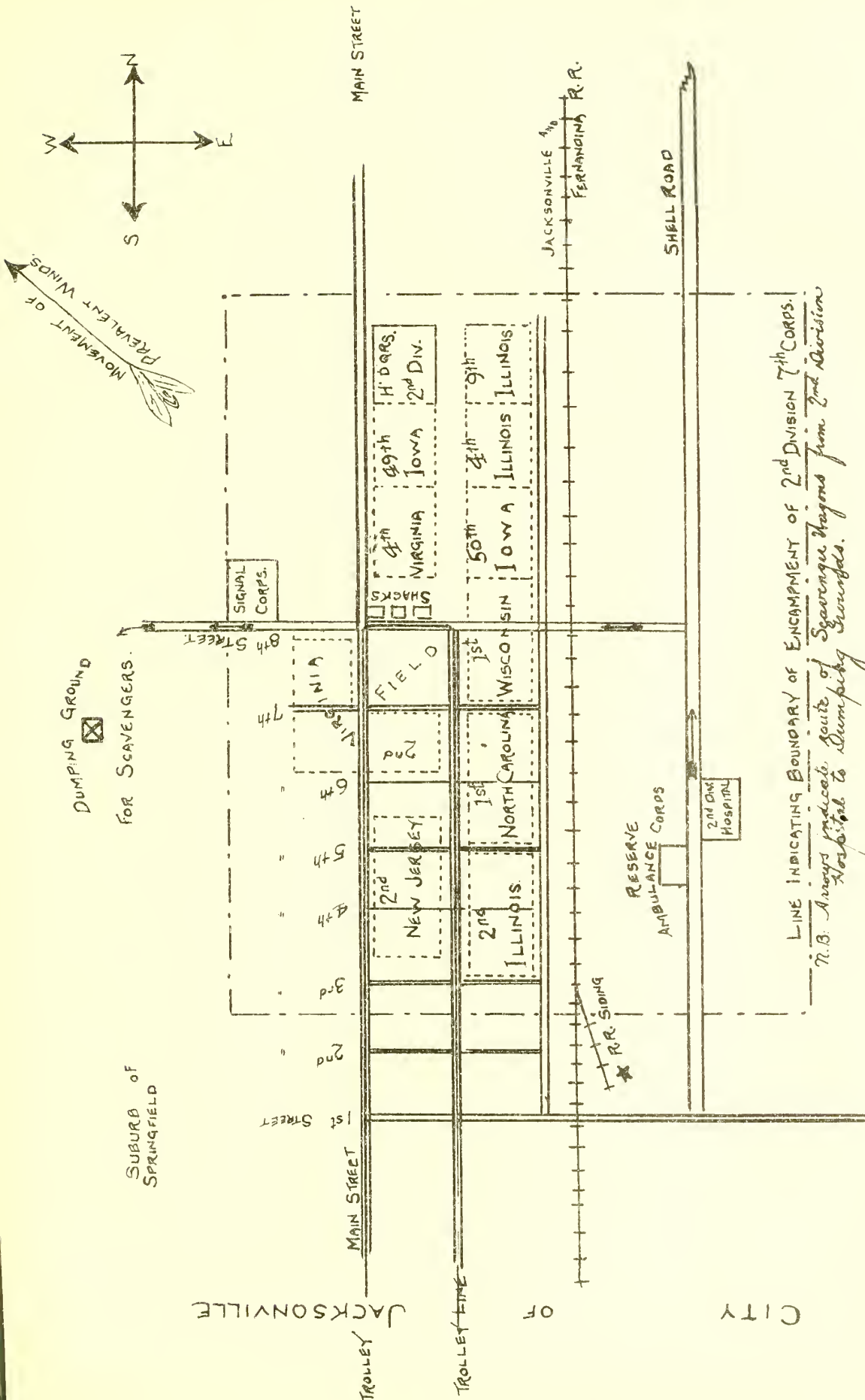
Total deaths	15
Deaths from typhoid fever	8
Percentage of deaths among probable cases of typhoid fever (156), 5.13.	
Percentage of deaths among recognized cases of typhoid fever (23), 34.78.	

TYPHOID FEVER IN THE SECOND DIVISION, SEVENTH ARMY CORPS.

THE SECOND DIVISION CAMP AT JACKSONVILLE.

This site was within the city limits, being placed on a rather level strip of land situated between the extension of Main street and the Jacksonville and Fernandina Railroad. The sketch map which follows will show the location of the several regiments in their first encampment at Camp Cuba Libre. Later, when typhoid fever became quite prevalent in certain regiments, the Ninth Illinois, Fiftieth Iowa, and First Wisconsin were moved to a somewhat more elevated site about 1 mile west of this camp, but still within the city limits, while the Forty-ninth Iowa and the Second and Fourth Virginia were removed to a site near Longbranch, some 3 miles distant. The first camp site of this division was not objectionable in dry weather, but when the rains began the location of the Forty-ninth and Fiftieth Iowa, Fourth Virginia, and First Wisconsin became undesirable, owing to the lack of natural drainage and their proximity to the swampy ground. (See sketch map.)

The water supply was piped from the city supply to each company street and was of excellent quality and very abundant. Pits were dug for the reception of kitchen slop, but as the camp was within the city limits pits for excreta were forbidden. For the disposal of excreta, therefore, half tubs were provided, which, when partially filled, were hauled away on wagons by the city authorities to a dumping ground, the tubs



ROUGH PLOT
 OF
 FIRST ENCAMPMENT OF 2ND DIVISION, 7TH CORPS,
 AT
 JACKSONVILLE, FLA.

SUBURB OF
 FAIRFIELD.

washed out by hose and returned for further use. As earth was not permitted to be used in these tubs their condition was extremely filthy, the contents being unprotected from flies, and frequently spilled out while being hauled away to the dumping ground. The location of the half tubs was in many instances in close proximity to the mess tents. (See regimental histories, Second Division.)

The amount of tentage was not sufficient for this division, the complaint having been repeatedly made to us that in many regiments eight men were sleeping in an A wall tent, 9 by 9 feet. The division commander testified to the insufficiency of tentage.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. Thomas C. Evans, chief surgeon Second Division, Seventh Army Corps.]

Jacksonville, Fla.—Questioned as to the cause he assigned for the development and spread of typhoid fever among the division, Major Evans replied:

We have speculated on everything at meetings of the medical officers every Friday night, and various reasons have been advanced, but I do not think that there are any of them that hold good.

Questioned as to the situation in the First Wisconsin, Major Evans stated:

I have inspected the camp time and again, and I caused the regiment to be moved from its old camp site. I can not say exactly how long they remained upon the old camp site. As to the origin of the disease in this regiment, Major McGill suggested that hauling the stools over the dusty roads and the splashing out of the contents and the blowing of the dust over onto the men's bread in the mess tents of the neighboring companies may have caused disease. I must say that I am totally at sea as to the cause. It has been noted that men sleeping in tents occupied by men who afterwards developed typhoid have themselves subsequently developed the fever. There has been no special investigation as to this point, but my attention was called to it last week. This has not been markedly so, but to some extent. In the outset the disease was in Companies H and C, and those two companies were camped on either side of the road along which the excrement was hauled. Subsequently, however, there has been a great deal of sickness in almost all the regiment.

SECOND NEW JERSEY VOLUNTEER INFANTRY.

First Brigade, Second Division, Seventh Army Corps.

ABSTRACT OF SURGEON'S TESTIMONY BEFORE THE BOARD.

[Maj. Charles F. Adams, surgeon.]

Seagirt, N. J.—The regiment assembled at Seagirt April 27, and was mustered in there May 12. We remained in that camp until June 1. (This is the permanent state encampment of the National Guard of New Jersey.) We had a few slight cases of diarrhea in that camp, but no dysentery or typhoid. We had some cases which were plainly simple intermittent fever develop there. We had twenty-six rainy days out of thirty-one while in that encampment. I mean the New Jersey rainy day, a continuous storm, not the Florida

style. I think this stormy weather helped to account for the intermittent fevers which appeared. Nevertheless, the general health of the command was remarkably good. Day after day I reported to the colonel that "there was nothing to report."

Jacksonville, Fla.—We came direct to Jacksonville, leaving Seagirt on the evening of the 1st of June, and reaching here the evening of the 3d. We have been here since that time on the same ground for thirteen weeks next Friday. (This testimony was taken about August 29.)

The water supply is that of the city of Jacksonville. It is distributed in the camp through iron pipes under pressure. There are no citizens located near our camp who have shallow wells in their yards. The men have been cautioned repeatedly and emphatically to drink only from the city water supply. Very little milk has been taken in the camp.

The method of disposal of fecal matter is that of the "slipshod" tub system. The tubs are presumed to have been emptied daily, but for a number of weeks they were emptied just as it happened. From the middle of June up until almost the 1st of August any sort of an excuse answered the city authorities for leaving the tubs for forty-eight hours. There was a strike among the scavengers about the 7th to the 10th of July, when the tubs went unattended for three days, and during this time the situation was as bad as it could be. I suggested another situation for the sinks when the camp was located, and I protested against their being placed where they were; but my protests had no effect. Some of the latrines were within 30 to 40 feet of the cook tents. My objection was based chiefly upon this dangerous proximity to the mess tents. "Of course the flies would take turns; during meals they would rest in swarms on the food, and between meals they were at the sinks." I do not think there was much scattering of toilet paper by means of the wind far from the position of the latrines. There was a special latrine guard, but there was always carelessness. The negroes who emptied the latrine tubs spilled the contents on the ground en route. This was a frequent occurrence, especially on Fourth street, and on this street (Fifth street), which was one of our battalion streets, until I obtained permission to arrest the drivers of the scavenger wagons if they passed through these (battalion) streets under any circumstances. They would spill the matter along the line of the latrines. (It should be noted that the line of latrines bordered the street which ran along the east flank of the regiment.) I think this practice of driving scavenger wagons through battalion streets lasted until about the 1st of July. I stopped it as soon as I noticed it. These scavenger wagons, after loading up from our latrines, would pass along Fifth street (the battalion street separating the Second Battalion on the north from the next battalion on the south). They may possibly have passed along this street also when carrying the

excrementitious matter from other regiments. In loading the tubs from the latrines upon the wagons I think they would have a tier of them on the bottom and another tier on these, so that carelessness or jolting would result in tilting the contents almost anywhere on the floor of the wagon or over its sides, permitting an overflow upon the ground. This spilling of feces along the ground during the hauling was mainly in the drier season, when we had not had much rain here.

Our regiment was upon slightly higher ground than the rest of the brigade and was perhaps a little better drained. It is possible that the Second Battalion, of which Companies G and L are members, is a little lower than the others. The battalion latrines of the regiment were in many cases within 30 or 40 feet of the mess tents. Our bath houses stood on the same line with the latrines, and the drainage from the bath houses was into an open sewer. The contents of this sewer flowed, first, along the line of sinks and bath houses and then through that battalion street which corresponds to Fifth street. There was a large amount of filth washed from the bath houses. It was most convenient for the men to urinate there, if they felt so inclined, during the shower bath, and there was consequently a horrible odor from this water. We had a filthy canteen, which sold beer and other drinks of that kind, that drained into the open sewer. This open sewer also received the overflow of the hydrants (attached to a water main which ran along within a foot and a half of this open sewer) as well as slops and dishwater which were thrown in. In fact, the whole thing was about as foul as it could be. These filthy conditions lasted here for a period of three weeks, until I got desperate and notified the board of public works in Jacksonville that the open sewer must be got out of there within forty-eight hours, whereupon they placed, instead, an open, three-sided wooden gutter, which prevents outside ground contamination; and they established a closed sewer, so that the water from the bath houses, latrines, etc., flowing along this gutter now flows into the sewer instead of along Fifth street. These radical changes, I think, were made about the 1st of August.

I had an opportunity to make a number of examinations as to the character of the soil. I made a number of borings as deep as I could without interfering with the surface water, say 8 to 10 feet deep. The surface soil is a light sandy loam of a foot to 18 inches in thickness, beneath which you strike a stratum of clay and then alternating strata for a depth of $2\frac{1}{2}$ feet in some places and then you find beneath that almost continuous clay as far as I went down. In some cases I was able to go 10 feet down, but in most places I found surface water 4 to 6 feet below the surface of the ground. The first borings gave us water at a trifle over 4 feet below the surface and I made experimental borings throughout the grounds of the camps of the Second Division and was very much surprised to find the conditions I

have mentioned. My borings did not extend to the other camps of the corps. This examination of the soil was made in consequence of a suggestion by the chief surgeon of the corps as preliminary to a project of his concerning a more satisfactory disposal of urine than was in vogue. The surface of the ground is almost flat, and after the Florida showers water would stand in places wherever the slightest depression in surface existed. This would be temporary, however, depending on the amount of the rainfall. The water may disappear in twenty minutes to half an hour; but during a storm in the early part of July the water was standing in the low places for three days. These areas of standing water were pretty large in proportion to the rest of the camp. I was away at the time of this heavy storm, but photographs were taken of the grounds at that time which showed very clearly that the ground of the encampment was almost a continuous lake.

We have had a great deal of typhoid fever since coming here, but I could not give the number of cases definitely. It began about the 1st of July. Diarrhea preceded the typhoid altogether. There were some cases of diarrhea that began just as soon as we struck this camp. Some of that dated on my register from June 3. Some of these have been persistent and one or two men have been discharged from that cause. Diarrhea was very marked for a month. I recall that on the 13th of June the number of men on sick report was only three-tenths of 1 per cent. There was a small number of cases of diarrhea during the first ten days, but after that diarrhea developed rapidly during the latter half of June. I think the number of cases of diarrhea now is not so large as it was twenty-five or thirty days ago, but the number of cases of intermittent and typhoid fever is very much larger now. The proportion between diarrhea and dysentery and typhoid is not the same as it was six weeks or two months ago. I attribute the cause of these diarrheas to errors in diet.

I should like to give the history of Company G, coming from my own town, Hakensack, N. J., 12 miles out of Hoboken. There were a number of people in Jacksonville (from this town) and some of the ladies of the party brought out to camp a supper for Company G. "The men had everything from shrimp salad to ice cream, and it fixed that company in great shape. They had 80 to 86 quarts of ice cream. We had the whole company on our hands in about forty-eight hours with diarrhea and cholera morbus, and from that time on until about 30 men came down with fever. The majority of these cases were remittent fever. Some 8 or 10 of these cases developed rapidly into typhoid having a very acute history and went to the division hospital. I was very much puzzled about this typhoid. They began to develop the typhoid fever within ten days of the feast." After this outbreak I had this company detailed up to the rifle range, what they call the Sand Hill, a very delightful location, and

since then their condition has been steadily improving until up to yesterday (about August 28) out of 106 there were 98 on duty, 2 away, and 6 sick. This transfer of location cleared up the whole thing, and they have come up in good shape. In response to an inquiry as to whether in his opinion some article of food infected this company, Major Adams replied: "I do not know whether it is proper to say it was some article of food or whether such an agglomeration of food as they put into their alimentary canal was such as to render them susceptible."

Company G belongs to the Second Battalion. It was located in our camp next to Company L, which latter occupied the extreme north flank of the regiment. It is to be remarked that Company L was the next one to suffer with typhoid fever. On the north side of Company L there was an open field, with no troops. To the northeast, about 100 yards away, there was located the First North Carolina, the sinks of which were not nearer than that. The latrines of the battalion to which Companies G and L belonged was nearer Companies F and E than the other two of this battalion, namely, G and L. The prevalent winds were from the southeast—that is, blowing from Fifth street. Two companies, E and F, were located between Fifth street and Company G. They did not at first have much typhoid fever, but have had more lately, following Company L. This battalion, the Second, has been particularly afflicted, while there has been no company in the regiment which has entirely escaped typhoid fever. Many of the cases showing continued fever, which were sent to the division hospital, were marked "Diagnosis awaiting."

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE SECOND NEW JERSEY VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. Ernest Shaw, commanding Company A, furnished a list of men grouped in tents, and stated substantially as follows: The Third Battalion was on the right, comprising Companies I, K, M, and H; the First Battalion in the center, Companies D, B, A, and C; Second Battalion on the left, Companies E, F, G, and L.

Company A was not on detached service.

The company was largely from an urban population; average intelligence was medium. The men were reasonably prudent as to personal conduct and habits, and the financial status was below the average.

There were five deaths from typhoid fever in this company, and there were several more cases which finally recovered from the disease. I do not think that we suffered more than other companies in this battalion or regiment. In my opinion, the fever was caused by being camped upon the same ground for so long a period. It was due to nearness of kitchen and company street to the latrine.

Capt. E. A. Scanlon, commanding Company B, furnished a list of men grouped in their tents, and stated substantially as follows: The grouping of the companies in battalion was, from right to left: Right battalion, Companies I, K, M, and H; center battalion, Companies D, B, A, and C; left battalion, Companies E, F, G, and L.

This company was never on detached service. It is from an urban population, and the intelligence of the men is about the average. The majority of the men were reasonably prudent.

I do not know the number of cases in other companies, and can not make a comparison. The sinks at the foot of my company street were about 75 feet from the end tents. The tents in this company were placed too close together to allow proper ventilation, and I think we were encamped too long on the same field, and the ground consequently became unhealthy from too long occupation.

Capt. Anderson Ely, commanding Company L, furnished a list of his men grouped in tents, and stated substantially as follows: The grouping of the companies in battalions was as follows, beginning at the right: The Third Battalion, comprising Companies I, M, K, and H; the First Battalion in the center, comprising Companies D, A, B, and C; the Second Battalion on the left, comprising Companies E, F, G, and L, this company being on the extreme left of the regiment.

About the 8th of June Company L was detached from the regiment for provost-guard duty, but remained quartered in its own camp while on that service. About the 22d of August this company was again detached on provost-guard duty, and went to Pablo Beach. They remained at Pablo Beach until about the 22d day of September, when they were ordered to Seagirt, the State camp of New Jersey. The location of the camp at Pablo Beach was a healthful one, near the ocean.

My company was chiefly from an urban population. The average intelligence of my enlisted men was medium. They were reasonably prudent as to personal conduct and habits affecting their health. Their financial status was perhaps a trifle below the average.

I do not think my company suffered more from typhoid fever than any other company from my battalion or regiment. I had six deaths in my company—five deaths from typhoid fever and one death from drowning. My company seemed to be the first most seriously attacked. I was well acquainted with each of those who died, except one, who was a Paterson recruit. One of those who died had been in my employ, and was a ruddy, healthy young fellow of excellent habits. He was a pressman and worked on the paper which I own at Hackensack. A corporal, the second to die, was a clerk employed in the Central Railroad office. He was of a rather nervous temperament, but a brave, spirited young man, and in every way exemplary as to his habits. He was, however, rather frail in appearance, the best shot in the company, and took great pride in military mat-

ters. Another corporal who died was, when he enlisted, the picture of ruddy health, and had a cheerful disposition, a mason by trade, with some private resources. He was tented with my son, who was a sergeant, Corporal K., a young lawyer, and Private C., a civil engineer. They were four as good young men, as cleanly in their habits and as sober and upright, as one could possibly desire. They took a great deal of pains to make their tent comfortable by boarding it and filling it up with pine needles. One of the men attended the funeral of the second man in the company to die, on a Saturday, and a week later the company held his funeral.

My company reached the Jacksonville camp June 1; the recruits came into camp during the month of July. One of the deaths above mentioned was among the recruits. A lance corporal returned home with his company, was immediately taken with typhoid fever, and died about the 15th of November. This was a finely built young man, of excellent habits, quiet, and sober.

To the left of us was an open space at least 400 feet wide, and then on the other side lay the camp of the Second Virginia. This space was covered with a quantity of undergrowth 6 or 8 inches high when we went there, but it was soon trampled down, and the space might then be considered a clear field. In front of us was a street, through which trolley cars ran, and on the opposite side of the street were encamped the Second Illinois, First North Carolina, and the First Wisconsin, and continuing off to the left were several other regiments.

At the end of the company street, on the border of the road, until about the 1st of August, were the sinks; and for each battalion there was a bath house. These were surrounded by plain pine-board frames without roofs. The sinks were pretended to be emptied each day. Inside the sinks was a row of perhaps ten or twelve half barrels. The colored men who came to empty them, with wagons, drenched the ground and dropped more or less of the contents. The sinks up to about the 1st of August remained in this location, and were a dreadful resort, to which necessity compelled the men to go. The flies and heat soon made a visit to the place like a visit to purgatory. Up to the arrival of the recruits the distance between the sinks and the last tent of the company street was 50 feet. The cooking for the company was done on a stove located about midway between the last tent and the sink. This stove was low, near the ground. Notwithstanding the intense heat, there was a little breeze which moved the dust, which was black and fine as powder. A plate left standing for ten minutes would be covered with this dust. The sinks were immediately at the foot of my company street, and my company occupied this street almost three months continuously. The next company, G, which was about as near to the sinks as was my company, was detached from the regi-

ment about the 1st of July, and went into a healthy camp at the rifle range, where surrounding conditions were extremely favorable. I was not personally in command of my company much of the time after we reached Jacksonville, though I lived in the company street until about the 15th of July—having been detached as provost-marshal under General Lee's order—when the command of the company devolved upon Lieutenant Blake.

One theory (as to the cause of our sickness) which I have had is that by reason of the scavengers dropping the contents of the sink tubs on the ground within a few feet of our kitchens this ground became gradually saturated with the stuff, and, in the form of powder to which I have alluded, it was peppered over the food which our men ate. There were a great many flies of the large, busy kind, and there had been some typhoid fever in other camps; men went from sink to sink; the flies went from cook house to cook house and from dish to dish. It does not seem that the fever can be traced to the water supply.

The camp itself was on a piece of ground which I would designate as a dried-up swamp; there was water just under the surface. I procured board floors for every tent. Most of the men slept on the floor. However, some made cots, and by other contrivances managed to raise themselves off the ground. The regimental camp was very cramped and the tents close together. The backs of the tents were close, and in the company streets the tents were as close as they could stand in a row. There seemed to me to be no proper inspection of the camp and no proper policing. I do not think that the officers generally comprehended the necessity for these precautions.

I have not my reports at hand to which I could refer, but during the month of August about half of my men were sick all of the time; and I think during the whole encampment, and after reaching home, at least one-half of the men had typhoid fever. I can safely say that those who had it were generally the best class of men in the company. A law clerk in my office who has been with me for many years, and is still with me, was sick and was expected to die. I think the division hospital was not ready to cope with the conditions with which they were confronted about the 1st of August, and consequently there may have been some neglect, for I noticed that of those in my company who were able to secure the benefits of proper nursing all recovered, while of those who were taken suddenly, not being able to communicate with their friends, all died.

Capt. Edward L. Petty, commanding Company M, stated as follows: The Third Battalion was comprised of Companies I, K, M, and H. Company M was never on detached service. The men came from the rural districts, and were of the medium class as to intelligence and financial status.

This company suffered from disease about the same

as the others in the regiment. Our regiment remained too long encamped on the same ground. The camp should have been moved. The sinks were bad and near the kitchen. The flies were very bad. The water was bad. It was very hot, the temperature ranging from 90° to 110°.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

May.—(Camp Voorhees, Sea Girt, N. J.) Mean strength averaged for — days: Officers, 51; enlisted men, 983; total, 1,034. Admitted from command, 42; total to account for, 42. Of 41 completed cases, all were returned to duty.

No remarks by the surgeon.

June.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 48; enlisted men, 950; total, 998. Remaining from last month, 1; admitted from command, 140; total to account for, 141. Of 124 completed cases, 102 returned to duty and 22 were transferred to other hospitals. Remaining on sick report in quarters, 17.

Abstract of remarks by Surg. Maj. C. T. Adams:

Left Camp Voorhees, Sea Girt, N. J., on June 1 to join the Seventh Army Corps. The regiment, consisting of 51 officers and 983 enlisted men under the charge of Col. E. W. Hine, proceeded by rail a distance believed to be about 1,200 miles to Jacksonville, Fla. No casualties en route. Went into camp at Camp Cuba Libre June 3, 1898, being assigned to the First Brigade, Second Division, Seventh Army Corps.

The health of the men has been excellent and the location and sanitary condition of the camp and grounds good. Twenty-six men have been taken from the command since our arrival and enlisted in the hospital and ambulance corps, United States Army.

July.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 50; enlisted men, 1,187; total, 1,237. From last month, 17; admitted from command, 277; by transfer, 8; total to account for, 302. Of 258 completed cases, 179 returned to duty; 1 died; 5 were discharged for disability; 73 were transferred to other hospitals. Remaining on sick report in quarters, 44.

Abstract of remarks by Surg. Maj. C. T. Adams:

On the 10th instant the strength of the command was increased by the arrival of 325 recruits from State recruiting camp at Sea Girt, N. J., accompanied by Lieutenant Kiefe, assistant surgeon, Third Regiment, New Jersey National Guard, as medical officer.

The health of the command, while far from perfect, has, however, been good, when compared with that of other commands both in this camp and generally throughout the country. The prevailing diseases have been mainly those of climatic origin, intestinal and malarial troubles largely predominating.

August.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 51; enlisted men, 1,271; total, 1,322. From last month, 40; admitted from command, 347; by transfer, 3; total to account for, 390. Of 317 completed cases, 166 returned to duty; 1 died; 8 discharged for disability; 142

transferred to other hospitals. Remaining on sick report in quarters, 73.

Abstract of remarks by Surg. Maj. C. T. Adams.

During the first week typhoid fever became prevalent and soon assumed the proportions of a severe epidemic. The cases have not been satisfactorily traced as yet. Possibly contributing causes were prolonged exposure to a debilitating climate, too long use of the same camp ground in excessively hot weather, a faulty camp ground (surface water at a depth of 3½ to 5 feet), and errors of diet and the use of alcoholics on the part of the men, notwithstanding frequent warning.

Such preventive measures as disinfection of sinks, building new sinks in improved locations, extreme care in policing, ventilating and disinfecting tents and grounds were employed; but, from the first, removal to a new and clean camp site was urged. This recommendation was not acted upon until the close of the month.

During the month 6 deaths occurred in the division hospital (Second Division Hospital, Seventh Army Corps) from typhoid, and 1 death from drowning is noted.

September.—(Camps Cuba Libre, Jacksonville, Fla., Pablo Beach, Fla., and Sea Girt, N. J.). Mean strength averaged for 30 days: Officers, 42; enlisted men, 1,128; total, 1,171. From last month 60; admitted from command, 140; by transfer, 1; total to account for, 201. Of 171 completed cases, 74 returned to duty; 1 died; 9 were discharged; 87 were transferred to other hospitals. Remaining on sick report in quarters, 30.

Abstract of remarks by Surg. Maj. C. T. Adams:

On September 2, following repeated recommendations to that effect by the regimental surgeon, the command was removed from the polluted camp at Camp Cuba Libre, to Pablo Beach, Fla. Immediate improvement followed in the general health of the command, but many cases of typhoid fever, in men who were probably infected before the regiment was moved, continued to develop.

On September 22, in obedience to orders from the War Department to that effect, the regiment moved from Pablo Beach, Fla., to Sea Girt, N. J., preparatory to being mustered out, bringing with it 60 men sick in quarters and 58 men dismissed from the hospital of the Second Division, Seventh Army Corps. Each train section was provided with medical officers and attendants and with medical, surgical, and other supplies for the sick.

No deaths or casualties occurred en route.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE SECOND NEW JERSEY VOLUNTEER INFANTRY.

Brief outline of the medical history.—This regiment assembled at Camp Voorhees, the State camp by the ocean, at Seagirt, N. J., April 27, 1898, was mustered May 12, and remained in that camp until the 1st of June, on which latter date it started by rail for Jacksonville, Fla. On the 2d of June the regiment arrived at Camp Cuba Libre, was assigned to the First Brigade, Second Division of the Seventh Army Corps, and went into camp with the Second Illinois and First North Carolina—the two other members of this brigade—in the suburb of Springfield, upon a site located within the corporate limits of the city of Jacksonville, remaining on that site without moving until the regiment went for recuperation to Pablo Beach, Fla., on the 2d of September. This command was encamped upon the

shore of the ocean at Pablo Beach from the 2d to the 22d of September, at which latter date it started by rail for its State camp at Seagirt, N. J., preparatory to muster out. How long the regiment remained at its State camp after returning there the board has been unable to learn definitely. We only know that on November 17, 1898, in another part of the State of New Jersey, namely, at Paterson, this regiment was mustered out of the service of the United States. No sick reports of the regiment later than September of that year have been obtainable. In truth, the medical records relating to this regiment seem to suddenly end on the date of its departure from Pablo Beach, Fla., homeward bound, on the 22d of September.

The medical history of this regiment, therefore, covers a period of four months and twenty-six days. Of this time thirty-six days were spent in the State camp by the seaside; three days en route by rail to Jacksonville, Fla.; from June 3 to September 2—ninety days—at Jacksonville, Fla., without once moving or shifting camp; at Pablo Beach, Fla., encamped on the shore of the ocean, from September 2 to 22—that is, twenty days.

The following history of this regiment in detail shows clearly that it did not import the infection of typhoid fever into the national camp at Jacksonville, Fla. The histories of the other New Jersey regiments also prove that no regiment proceeding from this State camp at Seagirt introduced into any of the national encampments the infection of typhoid fever.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the commencement of attacks were recorded as clearly as they could be ascertained.

[Second New Jersey Volunteer Infantry; mean strength, 1,153.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	All other.
May.....	3			3	4					
June.....	71	9	4	84	7	28			2	
July.....	59	29	12	100	55	28		29	59	1
August.....	33	19	8	60	83	36	27	93	156	6
September.....	2	3		5	30	14	29	63	106	16
October.....										2
November.....										4
December.....										
Total.....	168	60	24	252	179	80	58	185	323	29

A rectification of the number of so-called long malaria, as given in the above summary table by months, should

be made by reducing the total of 80 to 75, thus requiring a corresponding reduction of the number of total probable typhoid attacks from 323 to 318.

The above tabulated deaths from disease by months were distributed among the companies of the regiment as follows:

	Company.											Total.
	A.	B.	C.	D.	E.	G.	H.	I.	K.	L.	M.	
Typhoid.....	4	1	1	3	5	2	1	2	2	5	3	29
Other diseases.....	1						1		1			3
Total.....	5	1	1	3	5	2	2	2	3	5	3	32

The following is a series of three tables showing by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders, in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering), and (*b*) who have had such other attacks.

Combinations of typhoid fever in the Second New Jersey.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	11	8	4	17	12	9	7	11	10	13	11		1	125
Probable typhoid (uncombined).....	9	4	1	3	2	5		4	4	5	6	1	3	47
Typhoid beginning in diarrhea.....			1		1	2	2			1	1	1		9
Probable typhoid beginning in diarrhea.....	1													1
Typhoid preceded by diarrhea.....	2	2	1	3	3	3	1	3	1	6	5	4		34
Probable typhoid preceded by diarrhea.....	1	2		1	1							2		7
Typhoid preceded by malaria.....		3			2	1			1	1	4	4		16
Probable typhoid preceded by malaria.....					1	1								2
Combinations of three diseases.....		1										1		2
Total certain typhoid.....	13	13	6	20	18	15	10	14	13	18	23	21	1	185
Total probable typhoid.....	11	7	1	4	4	6		4	4	5	6	3	3	58
Total probable and certain typhoid.....	24	20	7	24	22	21	10	18	17	23	29	24	4	243

Combinations of continued or malarial fever in the Second New Jersey.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	9	6	11	7	10	10	8	14	7	5	11	10	1	109
Short malaria preceded by diarrhea.....	2	4		1	1	1		2		1	1	2		15
Short malaria followed by diarrhea.....								1		1		1		3
Two attacks short malaria.....	2				3	2			2	2	2			13
Diarrhea, malaria and diarrhea (short).....											1			1
Malaria, diarrhea and malaria (short).....					1									1
Short and long malaria.....	1	3		2						1				7
Long malaria (uncombined).....	7	9	4	8	2	4	9	2	2	3	3	3		56
Long malaria preceded by diarrhea.....	1	1			1	1		2		1	1	2		10
Long malaria followed by diarrhea.....									1					1
Two attacks long malaria preceded by diarrhea.....				1										1
Two attacks long malaria.....												1		1
Total short malaria.....	12	21	11	10	20	17	8	17	13	13	16	20		179
Total long malaria.....	9	13	4	13	4	5	10	3	3	5	4	7		80

Totals include malaria in typhoid combinations.

Intestinal disorders in the Second New Jersey.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Single short diarrhea...	10	9	12	12	2	4	7	4	12	14	3	4	.....	93
Two attacks short di- arrhea		1		2	2			1			1		.....	7
Short and prolonged diarrhea									1				.....	1
Long diarrhea	2	3	6	4	3	3	5	1	3	1	3	3	.....	37
Long and short diar- rhea					1								.....	1
Two attacks long diar- rhea					1								.....	1
Long and prolonged di- arrhea												1	.....	1
Prolonged diarrhea		3		2		1	1			1	1	4	.....	14
Total diarrhea.....	19	25	19	27	23	13	17	14	22	25	18	30	.....	252

Totals include diarrhea in malaria and typhoid combinations.

The records of sickness in this regiment were found to be more or less incomplete and to some extent conflicting. By way of illustration: There were 49 names of soldiers of this command entered upon the regimental sick reports as having been sent to division hospital whose names do not appear in the reports of the latter. Furthermore, the medical records relating to this regiment reveal 12 cases of intestinal disorder, 20 cases of so-called short malaria, etc., and 19 cases of so-called long malaria, etc., whose final disposition is not recorded. How many of these incomplete cases were really typhoid fever and should have been added to the total given in the above summary table it was, of course, impossible for us to estimate. That there were at least some, possibly many, we think can not be reasonably questioned. Moreover, we have found several cases of undoubted typhoid fever (one of them fatal) which we have not tabulated at all for lack of proper initial dates. In addition to all this, we have been unable to find any sick report of this regiment after the 22d of September, 1898, when the regiment left Pablo Beach, Fla., for Seagirt, N. J., preparatory to muster out, which latter event took place at Paterson, N. J., on November 17, 1898. Yet we learned incidentally that this regiment continued to suffer extensively from typhoid fever after the return to its State. The above tabular statement must, therefore, be regarded as an underestimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Second New Jersey Volunteer Infantry as a member of the First Brigade and Second Division may be recapitulated in the following condensed form:

(a) The regiment was in its State camp at Seagirt, N. J., by the seaside, from April 27 to June 1; it was in the national camp at Jacksonville, Fla., without changing site, from June 3 to September 2; it was at Pablo Beach, Fla., on the seashore, from September 2 to 22, when it departed for its State camp at Seagirt, N. J., preparatory to muster out; how long it remained in the State camp is not known by the board; it was mustered out at Paterson, in another part of the State, on the 17th of November, 1898. The initial date

of the first probable attack of typhoid fever was June 29, and of the first certain attack of typhoid fever July 3. The regiment, therefore, arrived at Jacksonville, Fla., uninfected with typhoid fever. Its medical history as given by the board covered a period of only four months and twenty-six days (from April 27 to September 22, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 252; of so-called short malaria, etc., 179; of so-called long malarial fever, etc., 75; of probable typhoid fever, 58; of certain typhoid fever, 185. Total attacks of probable typhoid fever (long malaria, etc., included), 318.

(c) Total deaths from typhoid fever, 29; total deaths from all diseases, 32; mortality per cent of total probable typhoid attacks, 9.11; of total certain typhoid attacks, 15.67; per cent of typhoid deaths to all deaths by disease, 90.62.

(d) The mean strength was 1,153. The per cent of typhoid mortality to mean strength: As to total probable typhoid attacks was 27.58, while the average for the brigade was 25.96; as to total certain typhoid attacks was 16.04, while the average for the brigade was 17.14. The number of typhoid deaths per 1,000 of mean strength was 25.15, while the average for the brigade was 18.46, and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever; and we have obtained the following figures as to the Second New Jersey:

Disease.	Individuals.	Average age.
Short intestinal disorders	99	24.6
Long intestinal disorders	37	24.9
Prolonged intestinal disorders	14	23.5
Total intestinal disorders	150	24.7
Short malaria, etc.	122	23.1
Long malaria, etc.	63	22.5
Probable and certain typhoid attacks.....	211	23.2
Total probable and certain typhoid and long malaria.....	274	23.0
Grand total of all above classes	546	23.5
Eighteen soldiers who died from typhoid fever.....	.....	23.6

For comparison of these average figures with similar data relative to other regiments in this brigade and division we refer to the general tables treating of this subject at the end of the Second Division of the Seventh Army Corps. (See also similar tables relating to certain regiments of the Second Army Corps at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) We find as nearly as it could be established that the companies constituting the Second New Jersey Regiment were grouped together in their camp at Jacksonville, Fla., commencing on the extreme northern flank

of the regiment, as follows: Second Battalion, Companies L, G, F, E; First Battalion, Companies C, A, B, D; Third Battalion, Companies H, M, K, I, the battalions being separated from each other by battalion streets. It should be noted here that Fifth street in the plan of the city of Jacksonville formed the battalion street between the First and Second Battalions, and that Fourth street lay immediately south of Company I, of the Third Battalion. By glancing at the graphic chart it is immediately seen that, as to the course of typhoid fever in the four companies constituting the Second Battalion, there was no synchronism either in the origin, course, or final portion of the curves representing sickness in these companies. There was also a dissimilarity in these respects between the companies constituting the First Battalion; and likewise the same dissimilarity was observable in the lines representing the course of sickness in the different companies of the Third Battalion. These dissimilarities in the course of company epidemics of the Second New Jersey would appear to be upon their face incompatible with the assumption of a common simultaneously and more or less continuously acting agency as the chief means of propagation of the epidemic.

(b) The company epidemics have frequent greater or less exacerbations in their course, and the intervals between these exacerbations as a rule are more or less closely coincident with the average period of incubation of typhoid fever. It is not necessary to especially elucidate this point by particular references. A close examination from this standpoint of the foregoing tabular statement and of the graphic chart representing the course of sickness in this regiment will more or less definitely substantiate the statement.

(c) Lieut. J. S. Wilson, assistant surgeon, U. S. Army, at the request of the board, after their departure from Jacksonville, prepared (with the aid of the regimental surgeon and the commandant of the Second Division Hospital) a general diagram map of the camp of the Second New Jersey, on which were specially indicated those tents occupied by men who were believed to have suffered attacks of typhoid fever previous to the 1st of September. Reference to that map is made at this point for the purpose of stating that upon it 68 attacks of typhoid fever are plotted in their tents, and that 38 of these, or 55.81 per cent, were in tents located in the half of the camp nearest the mess tents and sinks. But it is further noteworthy in this connection that the companies having the greatest number of attacks plotted in their tents were as a rule not those located nearest the battalion sinks. (See accompanying reproduction of this diagram map.)

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) According to the testimony of the surgeon in charge Company G had a peculiar experience with regard to food immediately preceding the commence-

ment of serious sickness in that company (refer to surgeon's testimony). It seems that within forty-eight hours after the promiscuous and liberal feeding of this company by visiting friends from their home locality with enormous quantities of ice cream, shrimp salad, etc., during the hot weather about the end of June (except date not known), there was a sudden explosion of intestinal disturbances affecting more or less seriously but temporarily practically the whole company. It is noteworthy, according to the surgeon's statement, that about ten days from that time a number of typhoid fever cases which were sent to the division hospital developed. (Note this ten-day period in connection with the discussion by the board of the period of incubation of typhoid fever.)

(b) Companies on detached service, temporarily separated more or less completely from the general influences affecting the whole command and subjected for a time to the influence of special surroundings and conditions. Under this head may be considered the same company, G, of which we have last spoken. The surgeon states that soon after the experience above described Company G was detached for some time on service at the rifle range, in an excellent camp, surrounded by favorable conditions, and that this transfer of the company cleared up the whole disturbance, for, according to him, "they have come up in good shape." The date of this service at the rifle range is not mentioned. After the serious outbreak in this company, as above mentioned, there was very little serious sickness in the company up to the time of its departure with the regiment from Florida, on the 22d of September.

Company L, according to the statement of the company commander, was ordered upon provost-guard duty in the surrounding country about June 8, but during this period of service it was quartered in the regimental camp. The length of this special service is not mentioned. It is to be noted, however, concerning this special detached service of Company L that it took place long before the infection of the regiment with typhoid fever, and could therefore have no special interest in estimating the value or effect of special company movements during typhoid-fever epidemics.

SPECIAL CHARACTERISTICS OF CERTAIN COMPANY EPIDEMICS AS EXHIBITED BY THE GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN TENTS, VIEWED FROM THE STANDPOINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) The squad groups of the sick as plotted in their respective tents would seem to be incompatible with the assumption that the chief factor in the propagation of typhoid-fever infection throughout the companies in question may have been some agency whose influence was common, and pretty constantly acting upon the whole company; on the contrary, they would appear to suggest a mode of disseminating infection which

ROUGH PLOT OF THE 2ND NEW JERSEY
AT JACKSONVILLE, FLA.

CAMP OF 2nd ILLINOIS

DRAIN

TROLLEY LINE → S H E L L

ROAD

DRAIN

[SINK] [BATH HOUSE]

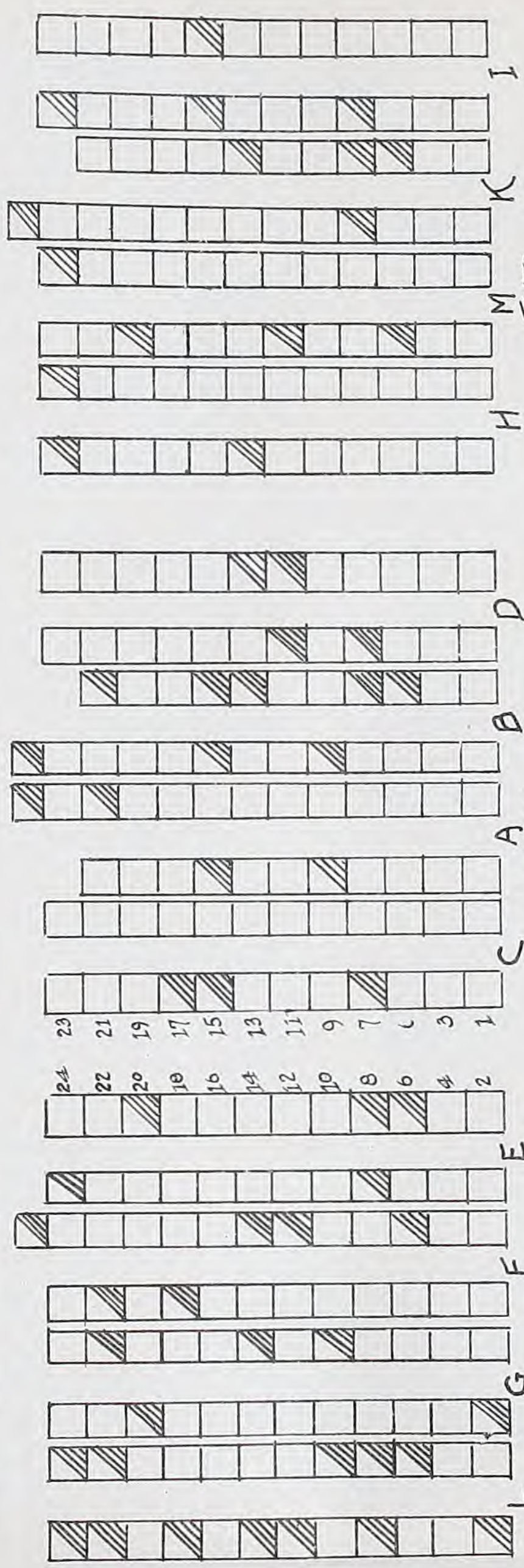
[SINK] [BATH HOUSE]

[SINK] [BATH HOUSE]

LINE OF OF

COMPANY

KITCHENS



OFFICERS

TENTS

HEADQUARTERS

☐ = TENTS HAVING TYPHOID.

TROLLEY LINE

←

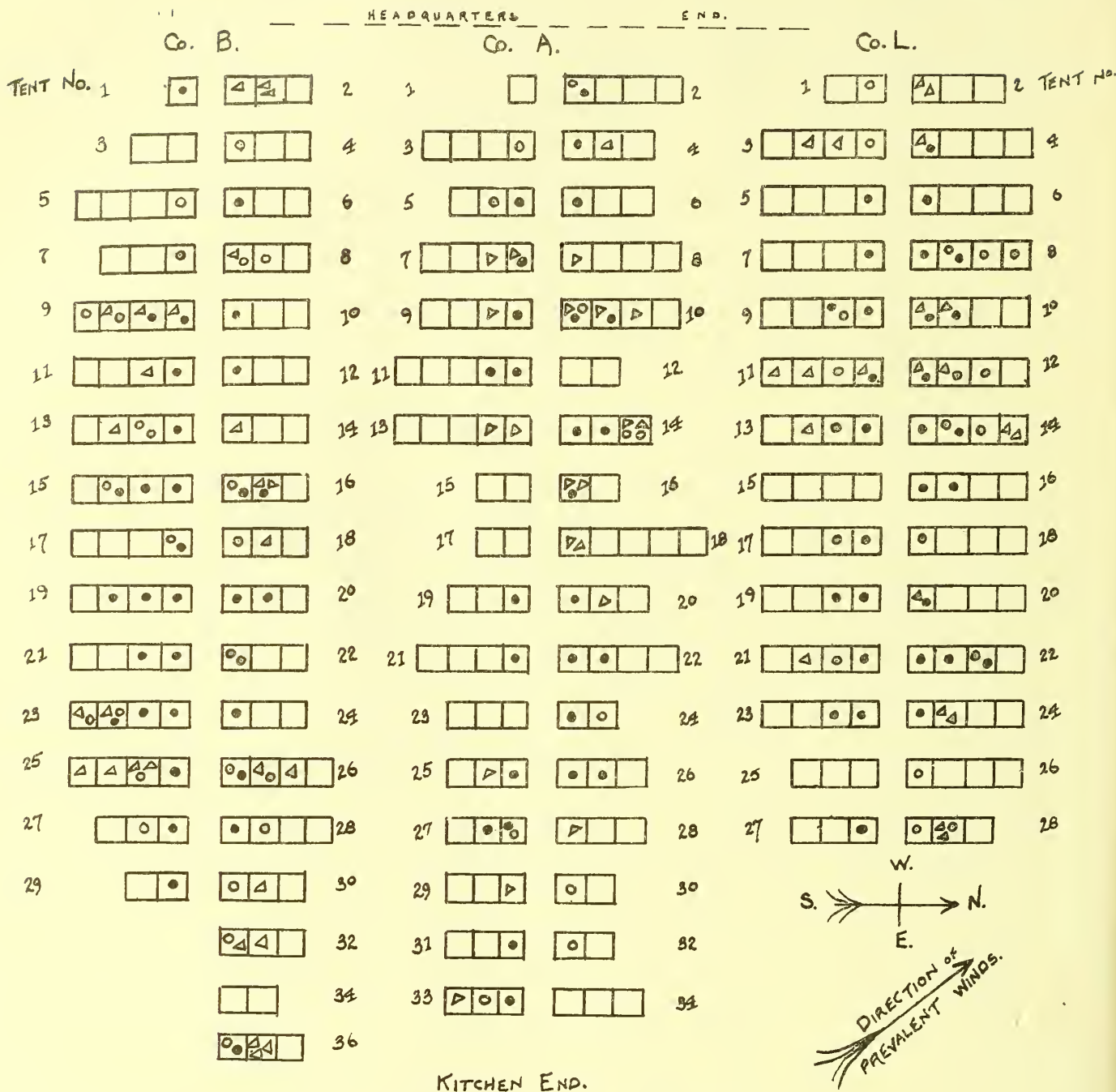
R O A D

MAIN STREET



2nd NEW JERSEY.

A DIAGRAM SHOWING THE GROUPING OF SOLDIERS IN
TENTS OF THREE COMPANIES AND THE SICKNESS AMONG THEM AS PLOTTED.



□ = ONE INDIVIDUAL IN TENT; ● = A TYPHOID ATTACK IN AN INDIVIDUAL; ○ = A MALARIAL OR FEBRILE ATTACK OF LESS THAN 10 DAYS IN AN INDIVIDUAL; △ = AN ATTACK OF INTESTINAL DISORDER IN AN INDIVIDUAL; TWO OR MORE SIGNS WITHIN A SQUARE INDICATE SUCCESSIVE CORRESPONDING ATTACKS IN ONE AND THE SAME INDIVIDUAL.

N.B:- COMPANY L WAS ON THE EXTREME NORTH FLANK OF THE REGIMENT, IN THE 2nd BATTALION; COMPANIES AND B ADJOINED ONE ANOTHER IN THE MIDDLE OF THE 1st, OR CENTRAL, BATTALION (SEE ALSO WILSON'S DIAGRAM OF THE REGIMENTAL CAMP).

TENTS ON THE RIGHT SIDE OF THE STREET HAVE THE ODD NUMBERS; THOSE ON THE LEFT SIDE HAVE THE EVEN NUMBERS.

more effectively reached and acted upon certain limited groups or squads of men while it passed by others, and which would be entirely compatible with the assumption of a dominating tent, squad, or comrade infection. We have endeavored to ascertain the names of soldiers as they were grouped in their company tents during the period of encampment at Jacksonville, in order to examine into this important question. To this end we have requested such data from two different sources, namely, from the regimental surgeons and from the commanding officers of companies. The information upon this point which we have received was obtained from the commanding officers of three companies of this regiment—Companies A, B, and L. Having obtained the names of the men as grouped in their tents, we were able to trace the recorded medical history of each person named, and in this manner to spot in the respective tents attacks of typhoid fever and of any other related illness. In this regiment, while in camp at Jacksonville, the tents were located upon each side of the company street, the odd numbers of tents being on the right and the even numbers on the left. (See accompanying diagram of Companies A, B, L, with sick soldiers plotted in their tents.)

There were 34 tents for Company A. In tents 5, 7, and 9, respectively, there was 1 case which the board has reckoned as typhoid fever; in tent 11 there were 2 cases; in tents 19 and 21, respectively, there were 1 and 2 cases; in tents 25 and 27 there were 1 and 2 cases, respectively; in tent 33 there was 1 case; in tents 2, 4, and 6 there was, respectively, 1 case; in tent 10, 1 case; in tents 14 and 16 there were, respectively, 1 and 2 cases; in tents 20, 22, 24, and 26 there were, respectively, 1, 2, 1, and 2 cases.

In Company B there were 15 tents on the right side and 18 tents on the left side of the company street. The tents on the right having typhoid fever were as follows: Tent 9, 2 cases; tent 11, 1 case; tent 13, 1 case; tent 15, 3 cases; tent 17, 1 case; tent 19, 3 cases; tent 21, 2 cases; tent 23, 3 cases; tent 25, 1 case; tent 27, 1 case; and tent 29, 1 case. On the left side, tent 6, 1; tent 10, 1; tent 12, 1; tent 16, 2; tent 20, 2; tent 24, 1; tent 26, 1; tent 28, 1; tent 30, 2.

Company L had 28 tents, an equal number on each side of the company street. On the right, tent 5, 1 case; tent 7, 2; tent 9, 2; tent 11, 1; tent 13, 1; tent 17, 1; tent 19, 2; tent 21, 1; tent 23, 2; tent 27, 1. On the left side, tent 4, 1; tent 6, 1; tent 8, 2; tent 10, 2; tent 12, 1; tent 14, 3; tent 16, 2; tent 20, 1; tent 22, 3; tent 24, 1.

In these three companies, and throughout the regiment, the number of tent occupants varied from three to five.

(b) A further indication of the existence and active influence of a tent, squad, or comrade infection in this command is the following result of a careful analysis we have made of the records of sickness in Com-

panies A, B, and L of this regiment in connection with the grouping of the affected men in their respective tents, and the average time elapsing between successive attacks in the same tent and in adjoining tents. In these three companies, of 123 attacks plotted there were 67, or 54.47 per cent, whose initial dates were found to be separated by periods varying between seven and sixteen days. (For more details concerning this matter we refer to the tables showing the number and per cent of connectable typhoid-fever attacks in tents, as deduced from captain's tent lists for the Second Division of the Seventh Army Corps. For comparison with similar data furnished by the Second Army Corps, refer to a similar table under that corps.)

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation in this disease from data obtained from two different sources, and we have found a striking coincidence in the figures thus obtained.

(a) Period of incubation as deduced from the length of intervals between successive or "connectable" attacks of typhoid fever occurring in the same and adjoining tents. In 123 attacks of typhoid fever occurring in Companies A, B, and L there were 50 intervals between individual connectable attacks from which the average period of incubation could be calculated. In these 50 cases the average interval or period of incubation between one attack and another was 11.3 days.

(b) Period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid-fever attacks. The Second New Jersey furnished 5 examples of diarrhea preceding typhoid fever by intervals which could be fairly regarded as measuring the period of incubation. The average period of incubation thus estimated from the 5 cases occurring in this regiment was 11.6 days.

For similar data concerning other regiments of this division, see the tables of the Second Division of the Seventh Army Corps relating to this subject and similar tables of the Second Army Corps.

SECOND ILLINOIS VOLUNTEER INFANTRY.

First Brigade, Second Division, Seventh Army Corps.

ABSTRACT OF SURGEON'S TESTIMONY BEFORE THE BOARD.

[Lieut. Ralph S. Porter, assistant surgeon, in the absence of the major-surgeon, acting as regimental surgeon.]

Springfield, Ill.—The regiment was assembled at Springfield, Ill., in May, 1898. I can not give a definite statement as to how long the regiment remained in the State encampment, but think it was nearly three weeks, more or less. There were a number of cases of cerebro-spinal meningitis while in the State encampment, but there was no typhoid fever to my knowledge,

and I could not say that there was any prevalence of enteric disturbances.

Jacksonville, Fla.—The regiment was ordered to Tampa, Fla., but while on the road was diverted to Jacksonville, Fla. I can not give the exact date of removal of the regiment, but it must have been about the middle of May. I myself arrived at Jacksonville on the 13th of July. My impression is that the regiment is now (August 29) located upon the site of its first encampment at Jacksonville. Not having served with the regiment before the date of my arrival, I can not make any comparison as to the prevalence of diarrhea and dysentery before and since that date, but I would say that they have not been extraordinarily prevalent. What trouble in that respect has existed has increased rather than lessened since my arrival. There had been some typhoid fever existing in the regiment at the time of my arrival here, but I can not tell the exact number of cases which have occurred since leaving Springfield. It is somewhere in the neighborhood of 20 cases up to the present time. Thus far there have been 5 deaths from typhoid, and there are now a number of cases in the division hospital, sent there as undetermined fevers, that have since developed into typhoid. Of the above-mentioned deaths, 3 have occurred among the men of Company F, 1 in Company G, and the other I can not tell in what company.

For the disposal of excrement in this camp tubs made of half barrels, having rope handles, were used. In response to numerous questions concerning this subject, Lieutenant Porter stated practically as follows: To his knowledge, he could not say that these tubs had been in pretty bad condition. He thought that they had been cleaned once a day and that there had been no day in which they had remained uncleaned. He had watched to see if there had been any splashing of the contents of these tubs during their removal, but he had never noticed it and had never noticed any splashing thereof along the road followed by the scavenger wagons hauling tubs. The company sinks or latrines have been located about 50 yards from the kitchen and mess tents—to the westward of them. He had noticed toilet paper upon the ground and had seen it lying upon the floor of the latrines. After the latrine tubs or half barrels were loaded upon the scavenger wagons they were necessarily hauled along near the company messes. I have seen them going between the end of the company streets at the messes and the latrines, not getting much nearer the mess than are the sinks, for the wagons would have to go right past the latter. The headquarters mess tent is nearer to where the wagons came along because the latter had to approach nearer that point in order to get to the road. One of our officers had typhoid. At the time he contracted typhoid he was detached at brigade headquarters.

This command has been much troubled with malaria, mostly remittent. Among the cases which have gone

to the hospital and which I have regarded as mostly remittent, I have noticed only a few which I believe to be intermittent fevers. I would say that these cases of remittent fever have remained in the division hospital two weeks before being returned to the regiment, and they were usually sick in quarters, perhaps two or three days, before being sent to the hospital.

Our men have been from time to time on duty at the rifle range (near Panama Park). In response to a question whether the men always had with them their canteens filled with water from the regimental hydrants while absent from camp on duty, Lieutenant Porter said that their canteens had been issued only just before the first time they went upon such duty. Previous to coming to Jacksonville there were not enough canteens for one battalion. The men were quartered in A wall tents, averaging four men, sometimes five per tent. For nearly a month now the men have been sleeping raised off of the ground. Previous to that time they slept upon the ground.

Replying to a question, Lieutenant Porter said that never to his knowledge had the water supply been turned off temporarily from the encampment.

ABSTRACT OF A COMMUNICATION FROM THE COMMANDER OF COMPANY I, SECOND ILLINOIS VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. H. E. Koeler, commanding Company I, stated substantially as follows: For the first month the men of my company used "pup" tents, covering two men; then they were given tents in which four or five men were housed. The company was distributed in the tents in the manner last mentioned for about three weeks, when twenty-seven recruits were received. This caused another redistribution of the members of the company among the tents.

Company I was of the Third Battalion. The companies of the regiment were arranged in battalions as follows from east to west: First Battalion, Companies D, B, A, and C; Second Battalion, Companies H, F, E, and G; Third Battalion, Companies K, I, L, and M.

Company I was on provost duty in the city of Jacksonville for fifteen days, beginning September 22, 1898. The men from this company were almost entirely from the city, and as to intelligence were above the medium. For the first five months of their service my men were very reckless. Many of them were from well-off families, and would spend more money than was drawn in their pay. "I believe my record shows that I had less typhoid fever in my company than there was in any other company of the regiment."

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

May.—(Springfield, Ill., and Jacksonville, Fla.) Mean strength averaged for fifteen days: Officers, 57; enlisted men, 848; total, 896. Admissions, 14; total to account

for, 14. Completed cases, 2; of which 1 died; 1 otherwise disposed of. Remaining on sick report, 7 in hospital and 5 in quarters.

Remarks of First Lieut. G. P. McGuire, assistant surgeon and acting surgeon.

At Camp Tanner, Springfield, Ill., during organization of regiment, from April 26 to May 19, 1898. En route to Jacksonville, Fla., to join the Seventh Army Corps, from May 19 to 23, from which date the regiment has been in camp at Camp Cuba Libre, Jacksonville, Fla. Distance, 1,385 miles by rail. At Camp Cuba Libre from May 24 to 31.

Sanitary conditions of camp good. Health of command good.

June.—(Jacksonville, Fla.) Average mean strength for 30 days: Officers, 45; enlisted men, 1,053; total, 1,098. Remaining from last month, 3; admitted from command, 43; total to account for, 46. Of 36 completed cases, 11 returned to duty and 23 were transferred to other hospitals. Remaining on sick report, 10.

Abstract from Acting Surgeon McGuire's remarks:

Health of regiment good, except one company—F. Prevailing disease, typhoid fever. The cause thereof is under investigation. Condition of camp grounds good.

July.—(Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,262; total, 1,309. Remaining from last month, 4; admissions from command, 195; total to account for, 199. Of 160 completed cases, 134 returned to duty, 2 discharged for disability, 45 transferred to other hospitals. Remaining on sick report, in quarters, 18.

Abstract of remarks of R. S. Porter, first lieutenant and assistant surgeon:

General sanitary condition of camp good. Ground flat in places, and after heavy rains drainage is somewhat imperfect. Sickness more than last month; prevailing disease, malarial fever.

Clothing of men is sufficient, but too heavy. The food abundant and well prepared.

Case No. 37, private, Company F, died in division hospital July 4; cause of death, typhoid fever. Case No. 30, private, Company F, died in division hospital July 11; cause of death, typhoid fever. Case No. 25, private, Company F, died in division hospital July 14; cause of death, typhoid fever.

August.—(Jacksonville.) Mean strength averaged for thirty-one days: Officers, 43; enlisted men, 1,202; total, 1,245. Remaining from last month, 18; admissions from command, 322; from other sources, 11; total to account for, 333. Of 285 completed cases, 183 returned to duty, 2 discharged for disability, 110 transferred to other hospitals. Remaining on sick report, 48.

Abstract of remarks from Asst. Surg. R. S. Porter:

General sanitary condition of camp good. Sickness more than last month. Prevailing disease, malarial fever—remittent. Food fairly abundant, and well prepared.

Case No. 424, private, Company I, died in division hospital August 18; cause of death, typhoid fever.

September.—(Jacksonville.) Mean strength averaged for thirty days: Officers, 41; enlisted men, 1,121; total, 1,162. Remaining, 9; admissions from command, 389; from other sources, 20; total to account for, 418. Of

345 completed cases, 210 returned to duty, 4 died, 5 discharged for disability, 126 transferred to other hospitals, 73 remaining sick in other quarters.

Abstract of remarks of Asst. Surg. R. S. Porter:

General sanitary condition of camp good. Sickness more than last month; prevailing disease, typhoid fever.

Private Company C, sent to division hospital from brigade headquarters Second Division, Seventh Army Corps, died September 3; cause of death, typhoid fever. Corporal Company C sent to Second Division Hospital from brigade headquarters, Second Division, Seventh Army Corps, died September 1; cause of death, typhoid fever.

Food abundant and well prepared. Clothing good.

October.—(Jacksonville.) Mean strength averaged for thirty-one days: Officers, 38; enlisted men, 966; total, 1,004. Admitted from command, 315; from other sources, 14; total to account for, 329. Of 281 completed cases 206 returned to duty, 10 were discharged, 75 were transferred to other hospitals. Remaining on sick report, 38.

Abstract of Acting Surg. G. P. McGuire's remarks:

General sanitary condition of camp good. Sickness less than last month. Food abundant and well prepared.

Private Company D, died at Second Division Hospital, October 19; cause of death, typhoid fever and intestinal obstruction. Private Company M, died Second Division Hospital October 12; cause of death, typhoid fever. Captain Company D, died in Chattanooga, Tenn., October 27, en route to his home in Chicago, Ill., on sick leave; cause of death, typhoid fever. First lieutenant Company C, died at Jacksonville, Fla., October 30 (died in a private residence in the city); cause of death, typhoid fever and hemorrhage of the bowels.

November.—(Camp Onward, near Savannah, Ga.) Average mean strength for 30 days. Officers, 38; enlisted men, 814; total, 852. Admissions, 170 as follows: Remaining from last month, 38; from command, 129; otherwise, 3; total, 170. Completed cases, 147, as follows: Returned to duty, 114; discharged, 1; transferred, 32; total, 147. Remaining on sick report, 23.

Abstract of remarks of Surg. G. P. McGuire.

General sanitary condition of the camp good. Sickness less than last month. Prevailing diseases, rheumatism and colds.

Private Company I died in Second Division Hospital, Jacksonville, Fla., November 23; cause of death, typhoid fever.

December.—(Camp Columbia, Habana, Cuba.) This regiment includes staff, band, headquarters, a detachment of United States Hospital Corps, and Companies A, B, C, D, I, K, L, and M. Mean strength averaged for thirty-one days: Officers, 45; enlisted men, 1,127; total, 1,172. Admissions, 140, as follows: Remaining from last month, 23; from command, 113; otherwise, 4; total, 140. Completed cases, 109, as follows: Returned to duty, 102; discharged, 1; transferred, 6; total, 109. Remaining on sick report, 31.

Abstract of remarks of Surgeon McGuire:

General sanitary conditions of the camp good. Sickness less than last month. Prevailing disease, bronchitis.

First and Second Battalions left Camp Onward, Savannah, Ga., December 10, 1898, and went aboard the U. S. transport *Michigan*.

en route to Habana, Cuba, arriving December 15, 1898. Went into camp December 15, 1898, near Marianao, Cuba, distant 8 miles from Habana.

Third Battalion left Camp Onward December 12, 1898, and went aboard U. S. transport *Mobile* en route to Habana, Cuba, arriving December 15, 1898, and went into camp with the First and Second Battalions December 17, 1898, near Marianao.

December 30, 1898, the Second Battalion, consisting of Companies E, F, G, H, were ordered under General Orders, No. 195, headquarters Seventh Army Corps, to proceed to Cienfuegos, Cuba, by rail. First Lieut. R. S. Porter accompanying medical officer.

REMARKS BY THE BOARD CONCERNING THE MEDICAL HISTORY OF THE SECOND ILLINOIS VOLUNTEER INFANTRY FROM APRIL 26 TO DECEMBER 31, 1898.

As appears from the indorsements upon the regimental monthly sick reports and from other information obtained this regiment assembled at Camp Tanner, Springfield, Ill., April 26, and remained in camp there until May 19, during which period it was mustered into the service of the United States, the exact date being undeterminable by us. On May 19 the regiment proceeded south by rail for Tampa, Fla., but while moving was diverted by telegraphic orders to join the regiments at Camp Cuba Libre, Jacksonville, Fla. Being en route four days it arrived in Jacksonville May 23. From May 24 to the middle of October (about five months) the regiment was at Camp Cuba Libre, occupying one camp site without moving. About the 24th of October, with the Seventh Army Corps, this command proceeded to Camp Onward, near Savannah, Ga., where it remained until December 10. On this date two battalions (comprising Companies A, B, C, D; I, K, L, M) went on board the transport *Michigan*, en route for Habana, Cuba, where they arrived December 15, and went into camp at Camp Columbia, near Marianao, about 8 miles distant. On the 12th of December the remaining battalion (Companies E, F, G, H) boarded the transport *Mobile*, en route for Habana, at which place they arrived December 15, and went into camp with the other two battalions in Camp Columbia December 17, where the whole command remained until the end of the month of December, except the Second Battalion (consisting of Companies E, F, G, H) which, on December 30, received orders to proceed by rail to Cienfuegos, Cuba.

May.—(Camp Tanner, Springfield, Ill.) The first regimental monthly sick report covers the last half of the month of May. According to the information obtained from this document it appears that the regiment was located at Camp Tanner, Springfield, Ill., from April 26 to May 19; that it was en route from Camp Tanner to Camp Cuba Libre, Jacksonville, Fla., from May 19 to 23, inclusive; and that it was stationed at the latter camp from the 24th of May to the 31st of May, inclusive. During this period the total mean strength was 896. The admissions to hospital were 14, with a total to account for of 14. Of 2 completed cases 1

died and the other was otherwise disposed of. There remained on sick report at the end of the month 7 in hospital and 5 in quarters. This report is signed by First Lieut. G. P. McGuire, assistant surgeon, acting surgeon in charge, who remarks that "the sanitary conditions of the camp are good. The health of the command is good." During the period of the encampment of the regiment near Springfield, Ill., as stated by Lieut. Ralph S. Porter, an assistant surgeon and acting surgeon, August 29, "there were a number of cases of cerebro-spinal meningitis while in the State encampment, but there was no typhoid fever to my knowledge, and I could not say if there was any prevalence of enteric disturbances." (It is to be noted that Lieutenant Porter was not with his regiment during the period discussed.)

A careful examination and analysis of all available medical records of this regiment during the month of May, including the monthly sick report of the surgeon in charge of the regiment and the records of the division and other hospitals which received patients from this regiment, shows the following as to diseases especially examined by the board. It seems that on May 17 there was an admission from this regiment to the monthly sick report of a man suffering with an attack of intestinal disorder for less than five days. There was one case of so-called malaria or continued fever admitted to sick report on May 25 and continuing under treatment for more than ten days. On May 29 there were three admissions of short malarial or febrile attacks for less than ten days. It appears also that on May 29 there were two soldiers in this regiment taken up on the sick report whose cases proved to be of a typhoidal nature. One of the latter cases was a private of Company B, admitted to sick report May 29, returned from division hospital June 27, recognized as a case of typhoid fever. The same man is again found in division hospital as admitted on August 15 and returned to quarters on August 16, the latter attack being diagnosed as acute diarrhea. The other case was that of a private in Company I, who was admitted to sick report on May 29, sent to division hospital June 1, from which he was sent back to quarters July 9 and returned to duty July 30. This was also a recognized case of typhoid fever. Of the cases of so-called long malaria or continued fever, already mentioned as having been admitted to sick report on May 25, the following record exists: "Musician admitted to sick report May 25; diagnosis not stated; returned to duty July 10."

Thus we have for the latter half of the month of May two recognized cases of typhoid fever, one in Company B and the other in Company I, and one suspicious case belonging to no company, whose hospital record extends over fifteen days, together with three cases of fever designated "malaria" whose record does not extend to ten days. All of these occurred at dates which render it quite certain that this regiment arrived at Camp Cuba Libre, Jacksonville, Fla., from its State

encampment near Springfield, Ill., already infected with the germs of typhoid fever. Whether the infection took place at Camp Tanner or en route to Jacksonville it is impossible to say definitely. We would point out, however, in this connection the relation of the average period of incubation of the typhoid fever in the Second and Seventh Army Corps, as reasonably established in our opinion for a large number of cases (elsewhere mentioned), and the dates of departure from Camp Tanner, arrival at Jacksonville, and of admission to sick report. We feel that we can very safely say that the incubation periods of these cases, both of the certain and suspicious ones, did not begin after arrival at Camp Cuba Libre.

June.—(Camp Cuba Libre, Jacksonville, Fla.) The regiment passed the whole of this month on the same camp site, near Jacksonville, Fla., whereon they had pitched their tents upon arriving May 23.

An examination of all available medical records for this month, embracing both regimental sick reports and division hospital records, shows that the remark of Acting Surgeon McGuire, referring to the prevalence of typhoid fever, was intended by him to apply only to Company F of this regiment. We have been able to convince ourselves that there was no typhoid fever in this regiment for the month of June, outside of Company F, except two cases of Company C, one case in Company I, and two probable cases in Company D. The analysis of all the available records for the month of June for the whole regiment is as follows: On June 5 there was one case admitted for malarial or ephemeral fever, lasting less than ten days. On the 8th there was another case of similar character. On the 10th there were two cases of a similar character. On the 11th there was an attack of intestinal disorder of less than five days' duration. On the 12th there was a case of fever of shorter duration than ten days, and on the same date there were two cases of intestinal disorder for less than five days. On the 14th there was a febrile attack of less than ten days. On the same date the record of the first attack of typhoid fever for the month of June began, and on the same date also there was an attack of intestinal disorder of less than five days. On the 15th there was an attack of fever of less than ten days, and on the same date began the record of the second attack in the regiment of what proved to be typhoid fever. Then there is an intermission until the 20th, when the third attack of typhoid fever during the month was admitted. On the 22d there were two cases of typhoid fever admitted to sick report. On the 23d there was recorded one of a similar character. On the 24th there were two of like character, and on the same date there was recorded an attack of intestinal disorder of less than five days, followed later by a subsequent attack in the same individual. On the 25th there was a febrile case of less than ten days. On the same date there were two attacks which ultimately proved to be typhoid fever, and on the

same day two attacks of intestinal disorder, running less than five days each. On the 27th there was an attack which developed into typhoid fever. On the 28th there was an attack of malarial or continued fever of more than ten days, and there were 2 attacks which proved to be typhoid. On the 29th there was an attack which developed into typhoid fever. On the same date a man was admitted to sick report with an intestinal disorder running less than five days. On the 30th there was 1 attack of fever running less than ten days, 1 attack of fever running more than ten days, 3 attacks which were certainly typhoid, and 1 attack which was probably typhoid.

The following is a summary statement of sickness comprising the three categories of disease into which the board inquired—namely, malarial or continued fever, typhoid fever, and intestinal disorders of a diarrheal character—for the month of June: There were 8 attacks of intestinal disorder, none of which ran as long as five days. There were 9 febrile or so-called malarial attacks running less than ten days and 2 febrile attacks (so-called malaria) of ten days and upward. There were 17 attacks of fever which may be regarded as certainly typhoid, and 1 attack which may be regarded as probable typhoid. For reasons elsewhere stated, we are of the opinion that the so-called malarial or continued febrile attacks which appear for a period of ten continuous days and upward upon the medical records of the regiments of the Seventh Army Corps should be really regarded as probably of a typhoidal nature rather than of a purely malarial or ephemeral character. In order to obtain, as we believe, a closer approximation of the real number of cases of typhoid fever in the regiment during the month of June, we must add the 2 cases of long malaria (so-called) to the 17 cases of certain typhoid and the 1 case of probable typhoid, making a total of 20 cases.

The foregoing attacks, as they occurred among the various companies for the month of June, were distributed as follows:

Company A: On the 11th 1 attack of short intestinal disorder, and on the 12th an attack of similar nature.

Company B had no attacks of the categories examined.

Company C: On the 5th an attack of febrile or so-called malaria lasting for less than ten days. On the 8th another of similar character. On the 27th 1 attack of certain typhoid. On the 29th 1 attack of short intestinal disorder of less than five days' duration. On the 30th 1 attack of short malaria less than ten days, and on the same date 1 attack of certain typhoid fever.

Company D: On the 30th 1 attack of so-called long malaria of ten days and over, and on the same date 1 attack designated by the board as probable typhoid.

Company E: On the 11th of June 1 attack of short malaria of less than ten days' duration. On the 25th 1 attack of intestinal disorder of less than five days' duration.

Company F: On the 12th there was 1 attack of fever, or so-called malaria, of less than ten days in duration. On the 14th there was 1 attack of certain typhoid. On the 15th 1 attack of certain typhoid. On the 20th there was 1 attack of certain typhoid. On the 22d there were 2 attacks of certain typhoid. On the 23d 1 attack of certain typhoid. On the 24th 2 attacks of certain typhoid. On the 25th 1 attack of short "malaria" of less than ten days' duration. On the same date 1 attack of certain typhoid, and again on the same date 1 attack of short intestinal disorder of less than five days. On the 28th 1 attack of so-called malaria of ten days or more in duration. On the same date 2 attacks of certain typhoid. On the 29th 1 attack of certain typhoid. On the 30th 2 attacks of certain typhoid. The total for this company during the month of June was 2 attacks of so-called short malaria, less than ten days; 1 attack of long malaria of ten days or more, 14 attacks of certain typhoid, 1 attack of other intestinal disorders of less than five days' duration.

Company G offers no record of the category searched for.

Company H: On the 10th 1 attack of so-called malaria of less than ten days' duration.

Company I: On the 25th 1 attack of certain typhoid.

Company K: On the 10th 1 attack of so-called malaria of less than ten days' duration. On the 24th 1 attack of intestinal disorder of less than five days' duration.

Company L: On the 12th 1 attack of intestinal disorder of less than five days' duration. On the 15th 1 attack of so-called malaria of less than ten days' duration.

Company M: On the 14th 1 attack of intestinal disorder of less than five days' duration.

Thus it seems that whatever the source of the infection of the different companies presenting attacks of typhoid fever during the month of June there does not appear to be any direct connection possible between them and preceding attacks in the same company except in the case of Company I, which latter, as will be remembered, presented in May 1 case of typhoid fever with an initial date of May 29, the June attack of typhoid having the initial date of the 25th. The interval here seems too long to warrant a presumption of direct connection between these two attacks. The other case of certain typhoid fever recorded for the month of May occurred in Company B. In this company for the month of June there is no recorded illness of the category examined by the board. It is noteworthy that in those companies presenting cases either of certain typhoid fever, of probable typhoid fever, or of prolonged malarial fever, no initial date of such an attack was earlier than the 25th of the month except in the case of Company F, which latter presented in other respects a noteworthy record. In the latter half of this month there was in Company F a very decided epidemic outbreak of attacks which were certainly of

a typhoidal nature. Between the 14th and the last day of the month, inclusive, there were 14 such cases appearing in Company F.

It is noteworthy that those cases of typhoid fever in Company F, as to their initial dates, occurred in three groups, separated from each other by average periods of seven and ten days, respectively, reckoning from the middle of each group. We shall frequently have occasion to record this singular grouping of attacks while discussing in detail the distribution of cases in infected companies, and we shall seek to show the meaning of such singular groupings when we attempt to establish the average period of incubation. Thus far the board has been unable to discover any explanation of the epidemic outbreak of this peculiar character limited to Company F. We could not learn of any peculiar circumstance surrounding this company which did not apply also to all of the other companies.

It should be remarked also that the medical records show no record for Companies A, B, E, G, H, K, L, and M, and the band, etc., of initial attacks of certain typhoid, of probable typhoid, or of prolonged malaria, which might possibly be regarded as typhoid fever.

July.—The regiment, during the whole of this month, remained upon the original camp site at Jacksonville, Fla., having a total mean strength, averaged for thirty-one days, of 1,309. The indorsements upon the regimental monthly sick report show that there remained on sick report from last month, 4; admitted from command, 195; total to account for, 199. Of 160 completed cases 134 returned to duty, 2 were discharged for disability, and 45 were transferred to other hospitals. There remained upon sick report at the end of the month, in quarters, 18. This report is signed by Lieutenant Porter, acting surgeon in charge, who states: "General sanitary condition of the camp good. Ground flat in places, and after heavy rains drainage is somewhat imperfect. Sickness more than last month; prevailing disease, malarial fever. The clothing of the men is sufficient, but it is too heavy. The food is abundant and well prepared. Case No. 37, private of Company F, died in division hospital July 4; cause of death, typhoid fever. Case No. 30, private of Company F, died in division hospital July 11; cause of death, typhoid fever. Case No. 25, private of Company F, died in division hospital July 14; cause of death, typhoid fever."

An analysis of all available medical records of this regiment for the month of July presents the following for the diseases of the category studied by the board: On July 1 there were 4 attacks of intestinal disorder not reaching five days' duration, one of which being in an individual who later suffered a similar attack, and there were also 5 attacks lasting five days or more—one of the latter cases likewise experiencing a subsequent similar attack. On the same date there were 2 febrile or so-called "malarial" attacks of less than ten days'

duration. On the same date also there was an attack which proved to be typhoid fever. On the 2d of July there were 2 attacks of intestinal disorder of less than five days' duration. On the 3d there was 1 attack of intestinal disorder of less, and also 1 attack of more, than five days' duration. On the same date there was a febrile or so-called malarial attack of more than ten days' duration, and on the same date an attack which later developed into typhoid fever. On the 4th there were 4 attacks of intestinal disorder of less than five days' duration, and on the same date a febrile or so-called malarial attack of more than ten days' duration. On the 5th there were 3 attacks of intestinal disorder of less than five days. On the 6th there were 5 attacks of intestinal disorder of less than five days and 1 attack of febrile or malarial disease of less than ten days. On the 7th there were 4 attacks of intestinal disorder of less than five days and 1 attack of similar trouble of more than ten days' duration. On the 9th there was an attack of intestinal disorder of less than five days. On the 10th there was an attack of febrile or malarial trouble of less than ten days. On the 12th there was an attack which developed into typhoid fever. On the 13th there were 2 attacks of febrile or malarial disturbance of less than ten days' duration, and on the same date there were 2 attacks which developed into typhoid fever. On the 14th there were 2 attacks of intestinal disorder of less than five days' duration. On the 15th there was 1 attack of intestinal disorder of less, and 1 attack of more, than five days—the latter in an individual who subsequently suffered a similar attack. On the 16th there were 5 attacks of intestinal disorder of less than five days, and a febrile or so-called malarial attack of more than ten days. On the 18th there were 3 attacks of intestinal disorder of less than five days. On the 19th there was an attack which developed into typhoid fever. On the 20th there was an attack which the board regarded as probable typhoid. On the 21st there was an attack of intestinal disorder of less than five days and there was a febrile or so-called malarial attack of less than ten days. On the 22d there were 2 attacks of intestinal disorder of less than five days, and another attack of a similar character in an individual who later suffered a like attack, and there was a febrile or so-called malarial attack of less than ten days' duration. On the 23d there were 2 febrile or so-called malarial attacks of less than ten days' duration. On the 24th there was an attack of febrile or malarial trouble of less than ten days' duration. On the 25th there were 5 cases of intestinal disorder of less than five days' duration, two of the individuals suffering similar attacks at a later period, 1 febrile or so-called malarial attack of more than ten days' duration, and 1 attack which developed into typhoid fever. On the 26th there were 3 attacks of intestinal disorder of less and 2 attacks of more than five days' duration, and 3 attacks which developed

into typhoid fever. On the 27th there were 3 attacks of intestinal disorder of less than five days, one of the individuals suffering a subsequent attack of similar character, 1 febrile or so-called malarial attack of less than ten days, and 3 attacks which developed into typhoid fever. On the 28th there was 1 attack of intestinal disorder of less than five days, 2 febrile or so-called malarial attacks of less than ten days, and 1 of more than ten days' duration, and 1 attack which developed into typhoid fever. On the 29th there were 4 attacks of intestinal disorder of less than five days' duration, one individual suffering a subsequent attack of similar character, and 1 attack which developed into typhoid fever. On the 30th there were 2 attacks of intestinal disorder of less than five days and 2 attacks which developed into typhoid fever. On the 31st there were 2 attacks of intestinal disorder of less than five days and 2 febrile or so-called malarial attacks of less than ten days.

The summary of the various categories of disease above mentioned for the month of July is 69 attacks of intestinal disorder; of these, 9 lasted five days or more and 1 lasted ten days or more, leaving 58 attacks of intestinal disorder of less than five days' duration; 16 febrile or so-called malarial attacks of less than ten days' duration, and 5 such attacks lasting ten days or more. Of the attacks which the board have designated as typhoid, there were 1 probable and 17 certain typhoids. Adding to the 17 certain attacks of typhoid fever the 1 probable attack and the 5 febrile or so-called malarial attacks of ten or more days' duration, we obtain a sum total of 23 possible attacks of typhoid fever for the month of July.

These various attacks were distributed among the various companies in detail as follows:

Company A: On the 1st there was an attack of intestinal disorder of less than five days' duration. On the 12th there was an attack which developed into typhoid fever. On the 13th there was an attack which developed into typhoid fever. On the 25th there were 2 attacks of intestinal disorder of less than five days' duration, 1 of the individuals suffering a subsequent attack of similar character. On the 27th there was 1 attack of intestinal disorder of less than five days in an individual who subsequently suffered a similar attack. On the same date there was 1 febrile or so-called malarial attack of less than ten days' duration. On the 28th there was an attack of intestinal disorder of less than five days' duration. On the 29th there was another attack of similar character. On the 31st there was an attack of intestinal disorder lasting five days or more. The summary of this company for the month of July is 7 attacks of intestinal disorder, of which 1 lasted five days or more and 6 lasted less than five days, 1 febrile or so-called malarial attack of less than ten days' duration, and 2 attacks of typhoid fever.

Company B: On the 1st there was an attack of intes-

tinal disorder of five days or more. On the 13th there was a febrile or so-called malarial attack of less than ten days. On the 25th there was an attack of intestinal disorder of less than five days, and 1 also of more than five days. On the 29th there was an attack of intestinal disorder of less than five days. On the 30th there was an attack of intestinal disorder of less than five days, and on the same date an attack which developed into typhoid fever. The summary of this company for the month of July is 5 attacks of intestinal disorder, of which 2 lasted five days or more, and the remaining 3 lasted less than five days; 1 febrile or so-called malarial attack of less than ten days, and 1 attack of typhoid fever.

Company C: On the 23d there were 2 febrile or so-called malarial attacks of less than ten days each. On the 24th there was a similar attack of less than ten days. On the 29th there was an attack of intestinal disorder of less than five days, in an individual who suffered subsequently a similar attack. The summary of this company for the month of July is 1 attack of intestinal disorder of less than five days' duration and 3 febrile or so-called malarial attacks of less than ten days' duration.

Company D: On the 1st there were 2 attacks of intestinal disorder lasting five days or more and 2 febrile or so-called malarial attacks of less than ten days. On the 6th there was an attack of intestinal disorder of less than five days. On the 7th there was a similar attack of less than five days and 1 of ten days or more. On the 16th there was an attack of intestinal disorder of less than 5 days' duration. On the 26th there were 3 attacks of intestinal disorder of less than five days and 1 attack which developed into typhoid fever. On the 28th there was a febrile or so-called malarial attack of less than ten days. On the 31st there was an attack of intestinal disorder of less than five days and 1 febrile or so-called malarial attack of less than ten days. The summary of this company for the month of July is 10 attacks of intestinal disorder, of which 2 lasted five days or more, 1 lasted ten days or more, and 7 lasted less than five days; 4 febrile or so-called malarial attacks of less than five days' duration, and 1 case of typhoid fever.

Company E: On the 2d there were 2 attacks of intestinal disorder of less than five days. On the 6th there was 1 attack of intestinal disorder of less than five days. On the 19th there was an attack which developed into typhoid fever. On the 21st there was an attack of intestinal disorder of less than five days. On the 24th there was an attack of intestinal disorder of less than five days, in an individual who subsequently suffered a similar attack. On the 26th there was an attack of intestinal disorder of five days or more. On the 28th there was an attack which developed into typhoid fever. On the 29th there was an attack of intestinal disorder of less than five days. The summary of this company for the month of July is 7 cases of intestinal

tinal disorder, of which 1 was five days or more in duration and 6 were of less duration; 2 cases of typhoid fever.

Company F: On the 3d there was a febrile or so-called malarial attack of ten days or more and an attack which developed into typhoid fever. On the 4th there was an attack of intestinal disorder of less than five days' duration and a febrile or so-called malarial attack of more than ten days' duration. On the 7th there was an attack of intestinal disorder of less than five days. On the 14th there was an intestinal attack of less than five days. On the 18th there were 2 attacks of intestinal disorder of less than five days. On the 21st there was a febrile or so-called malarial attack of less than ten days in duration. On the 26th there was an attack of intestinal disorder of five days or more and an attack which developed into typhoid fever. The summary of this company for the month of July is 6 attacks of intestinal disorder, of which 1 lasted five days or more and 5 lasted less than five days; 1 febrile or so-called malarial attack of less than ten days; 2 febrile or so-called malarial attacks of ten days or more; 2 attacks of typhoid fever. If now we add to the latter the 2 attacks of febrile disturbance of more than ten days' duration, we have a total of 4 cases of possible typhoid fever in this company for the month of July.

Company G: On the 15th there was an attack of intestinal disorder of less than five days. On the 22d there were 2 attacks of intestinal disorder of less than five days, 1 of the individuals having a similar attack later. On the 25th there was a febrile or so-called malarial attack of ten days or more. On the 26th there was an attack which developed into typhoid fever, as also one on the 27th. On the 28th there was a febrile or so-called malarial attack of less than ten days and 1 of similar kind of more than ten days. On the 30th there was an attack which developed into typhoid fever. On the 31st there was a febrile or so-called malarial attack of less than ten days' duration. The summary of the company for the month of July is 3 attacks of intestinal disorder of less than five days' duration, 2 febrile or so-called malarial attacks of less than ten days, and 2 febrile or so-called malarial attacks of ten days or more. Three attacks of typhoid fever. If we add the 2 febrile or so-called malarial attacks lasting ten days or more to the 3 attacks of typhoid fever, we obtain a sum total of 5 cases of possible typhoid fever in this company for the month of July.

Company H: On the 3d there was an attack of intestinal disturbance of five days or more. On the 5th an attack of intestinal disorder of less than five days. On the 7th an attack of intestinal disorder of less than five days. On the 13th there was an attack which developed into typhoid fever. On the 16th there were 2 attacks of intestinal disorder of less than five days' duration. On the 22d there was an attack of intestinal disorder of less than five days. The summary of this company for

the month of July is 6 cases of intestinal disorder, of which 1 lasted five days or more and 5 lasted less than five days. One attack of typhoid fever.

Company I: On the 4th there were 2 attacks of intestinal disorder of less than five days' duration. On the 6th there was an attack of intestinal disorder of less than five days' duration. On the 10th there was a febrile or so-called malarial attack of less than ten days' duration. On the 22d there was a febrile or so-called malarial attack of less than ten days' duration. On the 27th there was an attack of intestinal disorder lasting less than five days and 2 attacks which developed into typhoid fever. The summary of this company for the month of July is 4 attacks of intestinal disorder of less than five days in duration; 2 febrile or so-called malarial attacks of less than ten days' duration; 2 attacks of typhoid fever.

Company K: On the 1st there were 3 attacks of intestinal disorder of less than five days, one individual later suffering another attack, and an attack which developed into typhoid fever. On the 7th an attack of intestinal disorder of less than five days. On the 18th an attack of intestinal disorder of less than five days. On the 25th an attack which developed into typhoid fever. The summary of the company for the month of July is 5 attacks of intestinal disorder of less than five days. Two attacks of typhoid fever.

Company L: On the 3d there was 1 attack of intestinal disorder of less than five days; on the 5th another attack of the same duration; on the 6th 2 others of the same duration; on the 9th another of the same duration; on the 14th another of the same duration; on the 16th 2 more of the same duration; on the 25th 1 more of the same duration; on the 27th 1 of the same duration. On the 29th there was an attack which developed into typhoid fever. On the 30th there was an attack of intestinal disorder of less than five days. Summary of the company for the month of July is 11 attacks of intestinal disorder, all of less than five days. One attack of typhoid fever.

Company M: On the 1st there were two attacks of intestinal disorder of five days or more, one individual suffering another attack later of similar character. On the 4th there was an attack of intestinal disorder of less than five days; on the 5th a similar attack. On the 6th there was a febrile or so-called malarial attack of less than ten days; on the 13th, another attack of a similar character. On the 15th there was an attack of intestinal disorder of five days or more in an individual suffering a similar attack later. On the 16th there was a febrile or so-called malarial attack of ten days or more. On the 20th there was an attack which the board designated as probable typhoid. Summary of the company for the month of July is: Five attacks of intestinal disorder, of which 3 lasted five days or more and 2 lasted less than five days; 2 febrile or so-called malarial attacks of less than ten days; 1 febrile or so-called malarial attack of ten days or more; 1 attack of probable typhoid.

If we add the 1 febrile or so-called malarial attack of ten days or more and the 1 probable attack of typhoid fever, we have a sum total of 2 possible attacks of typhoid fever in this company for the month of July.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE SECOND ILLINOIS VOLUNTEER INFANTRY.

Brief outline of medical history.—This regiment assembled at Camp Tanner—the State camp—near Springfield, Ill., April 26 and remained there until May 19. On the latter date it started by rail for Tampa, Fla., but while moving southward was diverted by telegraphic orders to join the regiments of the Seventh Army Corps at Camp Cuba Libre, Jacksonville, Fla. En route four days, it arrived in Jacksonville on the 23d of May, and was attached to the First Brigade, Second Division, of the Seventh Army Corps. It went into camp with the Second New Jersey and First North Carolina—the other members of this brigade—in the suburb of Springfield, within the corporate limits of Jacksonville.

Up to the date of examination of this regiment by the board, near the 1st of September, it had certainly not removed from its first camp site in Jacksonville, or even shifted its position; and it probably did not do so until the brigade left Jacksonville, Fla., for Savannah, Ga.

About the 24th of October, with the brigade to which it was attached, this regiment moved by rail to Camp Onward, near Savannah, Ga., where it remained in camp until the 10th of December. On this date two battalions (Companies A, B, C, D; I, K, L, and M) embarked on the transport *Michigan* for Habana, Cuba, where they disembarked December 15, and went into Camp Columbia, near Marianao, Cuba, about 8 miles distant from Habana. On the 12th of December the remaining battalion (Companies E, F, G, and H) boarded the transport *Mobile* en route for Habana, arriving there on the 15th of the month, and joining the two other battalions in Camp Columbia on the 17th. The regiments remained in that camp the remainder of the month, except that the Second Battalion (Companies E, F, G, and H), under orders, proceeded by rail on December 30 to Cienfuegos, Cuba.

Although the service of this regiment under the Government did not cease until it was mustered out, April 26, 1899, at Augusta, Ga., just one year after first assembling in its State encampment, the board have not considered its medical history beyond the date of December 21, 1898. The movement of sickness in the Second Illinois as discussed here covers, therefore, a period of eight months and five days. Of this period, there were spent twenty-seven days in the State camp, four days en route by rail to Florida, one hundred and fifty-four days (including the whole summer and first half of autumn) in camp at Jacksonville (at least one hundred of these days, probably the whole time, without once changing or shifting the camp site). It was

during these one hundred and fifty-four days that nearly all the typhoid fever developed in this regiment.

As to the period while the regiment was at the State encampment, the acting surgeon states that "there were a number of cases of cerebro-spinal meningitis, but, to my knowledge, there was no typhoid fever there, and I could not say if there was any prevalence of enteric disturbances." This officer was not, however, with this regiment during this period. Another acting surgeon, in charge of his regiment at the time, remarks in the indorsement upon the first monthly sick report (embracing the month of May): "The sanitary conditions of this camp are good. The health of the command is good."

Notwithstanding these early cheerful indications by medical officers, the following detailed chronicle of the movement of sickness shows clearly that the Second Illinois arrived in the national encampment at Jacksonville, Fla., already infected with typhoid fever. Nor is this surprising, since, of the seven Illinois regiments assembled or mustered at their State encampment and afterwards sent to one or another of the various national encampments, only two arrived at the latter not transporting with them the infection of typhoid fever.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the commencement of attacks were recorded as closely as they could be ascertained.

It will be noticed by an examination of the tabular statement of sickness in this regiment that Company F experienced the first epidemic outbreak of typhoid fever at a date considerably in advance of the other companies of the regiment. We would call attention in this connection to the interesting remarks apropos of this subject by the chief surgeon of the corps. (See testimony of Lieutenant-Colonel Maus, chief surgeon of the Seventh Army Corps.)

[Second Illinois Volunteer Infantry; mean strength, 1,095.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Total probable typhoid, including long malaria.	Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.		Typhoid.	All other.
May.....	1	.....	.....	1	2	1	.....	2	3	.....	1
June.....	8	.....	.....	8	9	2	1	17	20	.....	1
July.....	57	10	1	68	16	5	1	17	23	3	.....
August.....	52	15	3	70	25	11	3	65	79	2	.....
September.....	31	14	9	54	28	22	8	91	121	10	1
October.....	52	14	2	68	24	12	6	47	65	2	1
November.....	20	2	2	24	14	11	5	13	29	1	.....
December.....	15	7	1	23	15	2	1	1	4	.....	.....
Total.....	236	62	18	316	133	66	25	253	344	18	4

A rectification of the total number of so-called long malaria, as given in the above summary table by months, should be made by reducing the total of 66 to 63, thus requiring a corresponding reduction of the number of total probable typhoid attacks from 344 to 341.

The above tabulated deaths from disease by months were distributed among the companies of the regiment as follows:

	Company.									Total.
	A.	B.	C.	D.	F.	G.	H.	I.	L.	
Typhoid.....	1	2	2	1	3	2	.....	2	5	18
Other diseases.....	.....	.....	.....	1	.....	.....	2	1	.....	4
Total.....	1	2	2	2	3	2	2	3	5	22

The following is a series of three tables showing by companies, respectively, the attacks of typhoid fever, of so-called malaria, and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we are considering), and (*b*) who have had such other attacks:

Combinations of typhoid fever in the Second Illinois.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined)	15	16	12	16	10	20	14	13	14	13	18	16	2	188
Probable typhoid (uncombined)	1	1	2	1	1	.....	3	3	3	1	3	.....		19
Typhoid beginning in diarrhea	.....	5	1	...	1	.....	3	2	1	...	5	...		18
Probable typhoid beginning in diarrhea	.....	.....	.....	.....	.....	.....	1	...	.....	.....	.....	.....		1
Typhoid preceded by diarrhea	2	2	2	5	3	...	1	2	2	1	5	2	.....	27
Probable typhoid preceded by diarrhea	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....		1
Typhoid followed by diarrhea	1	1	.....	.....	1	1	.....	.....	.....	.....	.....	.....		4
Typhoid preceded by malaria	1	1	2	3	.....	2	.....	.....	.....	2	1	.....		12
Probable typhoid preceded by malaria	.....	.....	.....	.....	1	1	.....	2	.....	.....	.....	.....		4
Typhoid followed by malaria	.....	.....	2	...	1	1	.....	.....	.....	.....	.....	.....		4
Total certain typhoid	19	25	17	26	14	22	25	23	17	14	30	19	2	253
Total probable typhoid	1	1	2	1	2	...	1	5	5	3	1	3	.....	25
Total certain and probable typhoid	20	26	19	27	16	22	26	28	22	17	31	22	2	278

Combinations of continued or malarial fevers in the Second Illinois.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Short malaria (uncombined).....	4	6	9	10	6	10	2	5	5	3	3	16	2	81	
Short malaria preceded by diarrhea.....	---	2	2	1	3	---	3	---	1	2	2	---	---	16	
Short malaria followed by diarrhea.....	1	---	1	---	1	---	---	1	2	---	---	---	---	6	
Short malaria preceded and followed by diarrhea.....	---	---	---	---	---	---	---	---	---	1	1	---	---	2	
Two attacks short malaria.....	---	---	---	---	---	1	---	1	---	1	---	---	---	3	
Short and long malaria. Long malaria (uncombined).....	1	---	2	---	1	---	---	---	---	---	---	---	---	4	
Long malaria preceded by diarrhea.....	3	6	2	2	5	2	8	2	1	7	2	4	2	46	
Long malaria preceded and followed by diarrhea.....	2	3	---	---	---	1	---	---	1	---	2	2	---	11	
Long malaria preceded and followed by diarrhea.....	---	---	---	1	---	---	---	---	---	---	---	---	---	1	
Two attacks of long malaria.....	---	---	---	---	---	1	---	---	---	---	---	---	---	1	
Total short malaria.....	6	9	16	16	11	13	10	8	10	7	8	17	2	133	
Total long malaria.....	6	9	4	4	6	5	8	2	2	7	4	7	2	66	

Totals include malaria in typhoid combinations.

Intestinal disorders in the Second Illinois.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Single short diarrheal	6	13	...	10	10	9	10	15	10	15	13	11	6	128	
Two attacks short diarrheal	4	1	1	1	2	1	2	...	1	3	1	2	...	19	
Short and long diarrheal	...	...	...	1	...	...	...	...	...	...	...	...	...	1
Short and prolonged diarrheal	...	...	...	...	1	...	...	...	...	...	...	...	...	1
Long diarrheal	3	4	...	4	1	4	2	4	5	2	1	3	...	33	
Long and short diarrheal	1	1	...	...	1	...	...	1	1	...	...	2	...	7
Long and prolonged diarrheal	...	...	1	...	...	...	...	...	...	...	...	...	...	1
Prolonged diarrheal	1	1	...	1	3	1	...	...	1	1	1	1	1	12
Prolonged and short diarrheal	...	...	...	...	...	...	2	...	...	...	...	...	...	2
Two attacks prolonged diarrheal	1	...	...	...	...	...	...	...	...	...	...	...	...	1
Total diarrheal	30	30	9	27	35	18	25	26	26	29	28	27	7	317	

Totals include diarrhea in malaria and typhoid combinations.

The records of sickness in this regiment were found to be more or less incomplete and to some extent conflicting. By way of illustration: There were 41 names of soldiers of this command entered upon the various hospital reports which could not be found upon the regimental sick reports; vice versa, there were 35 soldiers entered upon the regimental sick reports as having been sent to division hospital whose names do not appear in the reports of the latter. Furthermore, the medical records relating to this regiment reveal 10 cases of intestinal disorder, 42 cases of so-called short malaria, and 19 cases of so-called long malaria whose final disposition is not recorded. How many of these incomplete cases were really typhoid fever and should have been added to the total given in the above summary table it was of course impossible for us to estimate. That there were at least some, possibly many, we think can not be reasonably questioned. Moreover, we have found 5 cases of typhoid fever (1 of them fatal) which we have not tabulated at all for lack of proper initial dates. The above tabular statement should therefore be regarded as perhaps an underestimate of the prevalence of typhoid fever in this regiment.

The essential points of the medical history (including morbidity and mortality) of the Second Illinois Volunteer Infantry as a member of the First Brigade and Second Division may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Springfield, Ill., from April 25 to May 19; it was in the national camp at Jacksonville, Fla., from May 23 to October 24, and did not change camp site there before the 1st of September, if at all; it was in the national camp near Savannah, Ga., from October 24 to the 10th and 15th of December, and at Camp Columbia, Cuba, from the 15th to the 31st of December, 1898, and it was mustered out at Augusta, Ga., April 26, 1899. The initial date of the first probable attack of typhoid fever was May 25, and of the first certain attack of typhoid fever was May 29. The regiment, therefore, arrived at Jacksonville, Fla., carrying with it the infection of typhoid fever. The medical history covers a period of eight months and

five days—from April 25 to December 31, 1898—and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorder, 316; of so-called short malarial fever, etc., 133; of so-called long malarial fever, etc., 63; of probable typhoid fever, 25; and of certain typhoid fever, 253. Total attacks of probable typhoid fever (including long malaria, etc.), 341.

(c) Total deaths from typhoid fever, 18; total deaths from all diseases, 22; mortality per cent of total probable typhoid fever attacks, 5.27; of certain typhoid attacks, 7.11; per cent of typhoid deaths to all deaths by disease, 81.81.

(d) The mean strength was 1,095. The per cent of typhoid morbidity to mean strength as to total probable typhoid attacks was 31.14, while the average for the brigade was 25.96; as to total certain typhoid attacks was 23.10, while the average for the brigade was 17.14. The number of typhoid deaths per 1,000 of mean strength was 16.43, while the average for the brigade was 18.46, and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Second Illinois:

Disease.	Individuals.	Average age.
Short intestinal disorders	109	24.3
Long intestinal disorders	35	24.1
Prolonged intestinal disorders	15	24.7
Total intestinal disorders	159	24.3
Short malaria, etc.	98	24.6
Long malaria, etc.	47	25.1
Probable and certain typhoid attacks	258	24.3
Total probable and certain typhoid and long malaria	305	24.5
Grand total of all above classes	562	24.6
Sixteen soldiers who died of typhoid fever	...	23.8

For comparison of these average age figures with similar data relative to other regiments in this brigade and division, we refer to the general tables treating of this subject at the end of the Second Division of the Seventh Army Corps. (See also similar tables relating to certain regiments of the Second Army Corps, at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) It is only when we study the course of sickness in the regimental organizations from the standpoint of individual companies that we can adequately appreciate the fact that company epidemics are rarely synchronous. A mere glance at the graphic chart of this regiment will furnish an illustration of the truth of this fact. It is not necessary to refer to details concerning this point. Not only are there variations in the company epidemics when considered as integral parts of the regimental

organization, but as a rule there is no striking similarity in the course of the company epidemics even in those companies grouped together in battalion organizations. As closely as it could be ascertained the order of the companies in the battalions of this regiment as in the camp at Jacksonville seems to have been, from north to south, as follows: C, D, B, and A in the north battalion; H, F, E, and G in the middle battalion; I, K, L, and M in the south battalion. It appears that the battalion street separating the north and middle battalions was Fifth street in the suburbs of Jacksonville, and that Fourth street in the plan of that city bordered the south flank of the regiment, Company M being located just north of Fourth street. It should be noted that Company A, of the north battalion, and Company H, of the middle battalion, lay, respectively, on the north and south side of Fifth street.

(b) As in other regiments of this division, the epidemics in the companies of this regiment showed frequent greater or less exacerbations in their course; and the intervals between these exacerbations were more or less coincident with the average period of incubation of typhoid fever. (A full discussion of this point will be found in the general remarks under the Second Division, Seventh Army Corps; as also under the Second Army Corps at Camp Meade).

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) We would call attention to the peculiar history of the origin of an epidemic of typhoid fever in Company F, already referred to in the discussion of sickness in this regiment, and to the remarks of the chief surgeon of the Seventh Army Corps, in relation to the coincidence of consumption of bad beef with the first outbreak of serious disease in this company. Reference to the graphic chart shows the existence of a severe outbreak of typhoid fever in this company long in advance of the appearance of the disease in epidemic form in other companies of the regiment.

(b) In passing we would call attention to the fact that, according to the testimony of the regimental surgeon, scavenger carts passed along the battalion street separating the north and middle battalions of this regiment, passing out of the regimental camp into the camp of the Second New Jersey. And we would also call attention to the fact that along the southern border of Fourth street, forming the southern boundary of the regimental camp of the Second Illinois, was located a number of lunch shacks. There is no certainty that scavenger carts passed along this street.

(c) The testimony concerning the detached service of the companies of this regiment is as follows: Company G, of the First Battalion, on the north was detached from the regiment on provost-guard duty in the city of Jacksonville from July 13 to 20. The graphic chart shows that on the day of commencement of this service there

was an attack of typhoid fever in this company, and that on the 24th, four days after the return of the company to the regimental camp, a series of attacks of typhoid fever began. With regard to these attacks of typhoid fever at the commencement and after the return from this detached service, it may be said that the first case must have been infected previous to the separation of the company from the command, and that the series of attacks beginning four days after rejoining the command can well have been infected either at the time of the separation from the regiment or have owed their origin to the first case.

It can not be affirmed with any definiteness that this latter series of cases was due to peculiar conditions surrounding the service of the company in the city of Jacksonville. Company K, of the Third or south battalion, was detached on provost-guard duty in the city of Jacksonville from July 21 to 31 (?). A glance at the graphic chart shows that there was an attack of typhoid fever in this company on July 1. The next attack occurred on the 25th, which latter, of course, owed its origin to infection received previous to detachment. On the 1st of August there was another attack of typhoid fever, and on the 13th one more attack. The chart shows a series of attacks of typhoid fever from the 27th of August to the 4th of September, followed by other series of attacks throughout September and October. It is difficult therefore, in view of all these facts, to attribute any special influence to this detached service upon the course of fever in this company. Company F, of the Second or middle battalion, was detached from the regiment on provost-guard duty at Pablo Beach, Fla., from August 5 to 18. It will be remembered that this is the company that had the peculiar history of an early severe outbreak of typhoid fever. Reference to the graphic chart will show that after the early infection of this company there was a long absence of renewed attacks, there being only two typhoid attacks recorded between the 6th of July and the 24th of September, inclusive. We can not infer, therefore, that the detached service of this company on the seashore at Pablo Beach had any influence upon the course of typhoid fever in the company. Company L, of the Third Battalion, was detached from the regiment on provost-guard duty in the city of Jacksonville from August 14 to 23. A glance at the graphic chart shows that at the time of detached service it was suffering an epidemic of typhoid fever, and that two days after the beginning of this detached service there was a sudden increase in this company epidemic, this sudden increase of course being due to infection previous to the detachment. Three days after the return of the company to the regimental camp there was another exacerbation of the company epidemic, due presumably to infection during the early part of detached service. Under the circumstances we have no right to infer that these sudden exacerbations were due to other infection than that which the company itself carried with it on

this detached service. The company continued to suffer to some extent after returning to the regiment.

Just what influence the detached service had upon the course of the epidemic in this company it is difficult to estimate. Whatever influence it may have possessed it certainly was not decisive. Company E of the Second, or middle, Battalion was detached from the regiment on provost-guard duty in the city of Jacksonville from September 5 to 15. Reference to the graphic chart shows that this company had been having a few scattered cases of typhoid fever from time to time previous to this detached service; that on the 14th of September, the day before the return to the regiment, 3 attacks of typhoid fever developed. On the 20th, five days after their return, 2 more attacks occurred. And from the 26th to the 28th, inclusive, a sharp outbreak of typhoid fever occurred in this company. Whether the typhoid attacks between the 14th and 28th of September, inclusive, were attributable to sources of infection peculiar to the detached service can not be definitely determined. One thing, however, is certain, namely, that the sudden outbreak occurring between the 26th and 28th, inclusive, comprising 8 attacks, began ten days after the company rejoined the regiment. It seems probable, therefore, that this last infection took place just at the end of this detached service in the city of Jacksonville. Company I of the Third, or south, Battalion was detached from the regiment on provost-guard duty in the city of Jacksonville from September 22 to October 7. Reference to the graphic chart shows that at the time this detachment began the company was already suffering to some extent from typhoid fever; that there was an interruption of the epidemic during the time of this detachment, to be followed again immediately after rejoining the regiment by recurrence of attacks. There is no warrant for concluding that this interruption was due to the detachment. On the other hand the group of attacks occurring immediately after the company rejoined the regiment may have received their infection either immediately previous to the detachment or in the early days of the detached service. The influence of detached service in this company must therefore remain indefinite.

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation of this disease from data obtained from two different sources, and we have found in the general averages a striking coincidence in the figures thus obtained.

(a) This regiment furnishes data from only one of these two sources—the period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid-fever attacks. The Second Illinois furnishes 5 examples of diarrhea preceding an attack of

typhoid fever by periods which may fairly be regarded as measuring the period of incubation. The average length of the interval or period of incubation of these 5 cases was 9.8 days.

N. B.—For similar data concerning other regiments, see tables of the Second Division, Seventh Army Corps, relative to this subject, and also similar tables for the Second Army Corps.

FIRST NORTH CAROLINA VOLUNTEER INFANTRY.

First Brigade, Second Division, Seventh Army Corps.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

[Maj. Hilary Madison Wilder, surgeon.]

Raleigh, N. C.—The regiment volunteered on the 27th of April, rendezvoused at Raleigh, N. C., May 2, and commenced mustering in by companies on the 3d of May, ending by the 11th. The regiment remained encamped at Raleigh until the 22d of May. The water supply at Raleigh was at first from a stream or "seeping spring," which also constituted the water supply of St. Mary's School. The disposal of excrement while in that camp was by means of pits, covered lightly each day by earth. The surgeon did not believe they had any typhoid fever while in that camp. There was very little diarrhea and dysentery and very little sickness of any character.

Jacksonville, Fla.—The regiment started from Raleigh, N. C., on the 22d and reached Jacksonville the 23d of May, going into camp near the Second Illinois and the Second New Jersey. We were placed between the Second Illinois and the First Wisconsin, but the latter left that site about the 1st of August, moving camp on account of severe sickness. The character of the ground on which we located is low. Where our headquarters are you can see the remains of cypress trees or roots. Upon such ground you are bound to have malaria; that is the common opinion in the South, and it is a correct one, too, for these cypress trees grow in damp alluvial soil where no "gopher" will build. This is a kind of animal that burrows in the ground and always avoids soil where the rich alluvial earth is such as is apt to be filled with water. This ground was selected by General Lawton, who was here at that time, the first officer who met us, and personally assisted in the unloading of the live stock from the cars, leading the horses out.

It is my recollection that the pipes for the water supply were already laid when we arrived, this water supply being from the city of Jacksonville, from deep artesian wells. Replying to a question as to whether the water supply of the regimental camp had, for the purpose of repairs to the water mains or for any other purpose, been temporarily turned off from the regiment, the surgeon said that he remembered this having been done at one time. He could not fix the exact date, but he would say it was three or four weeks ago (about 1st

to 7th of August). It was his impression that they had been warned of the intention of the water department to temporarily interrupt their water supply, and that, in consequence, a certain amount of water had been stored to meet this temporary interruption. This was after the overflowing of the ground through which the water mains ran, later referred to. Immediately after this interruption of the water supply he did not notice any change in the taste of the water. It was always splendid water—the best that he had ever drank in his life.

In discussing the reason why the First North Carolina had suffered less from typhoid fever than had the First Wisconsin, the adjoining regiment, Major Wilder remarked that the officers of the First Wisconsin never exercised the discipline in keeping the men within the lines of their camp that we did. "We got a black eye when we first got here, in consequence of our men getting drunk and fighting. This caused the colonel to put the screws to them, and it had a good effect in preventing them from getting pies, milk shakes, etc., at the numerous negro shacks where such things were vended along the roads outside of the camp lines." He believed these shacks obtained their water from the identical source from which the regiment obtained their water. He thought, however, that the shack venders got their milk from so many sources that, if there is anything in the germ theory and in the belief that milk is a culture, the milk sold in these shacks must have been very liable to contamination. These shacks were located along the "shell road," running through the First Wisconsin, between Companies H and C. The great majority of these shacks moved away as soon as that regiment moved (about August 1). Furthermore, we had a canteen, and the men had to get everything there, for the colonel would not let them out. The little milk which was consumed would be sometimes condensed milk and sometimes milk from wagons in the camp.

The location of our camp has not been changed since we arrived at Jacksonville. I have recommended the change, but the officers were pleased with the site—it was convenient to get on the trolley cars going to town. Nearly all the tents now have floors raised above the ground 16 or 18 inches. Under the floors lime is scattered, for this is thought to improve the health of the command very greatly, although we have been very healthy. It is only recently that the quartermaster would purchase lumber for the floors. Formerly most of the men were sleeping upon the ground or upon hay, which would get musty.

We had more room in our camp than did the Second New Jersey. "I have never allowed more than four men to be in a tent; the quartermaster said six had to go, but I put my foot down on it. I said, army regulations or no army regulations, it should not be done."

As to the disposal of fecal matter: Our system for the disposal of excrement is that of "tubs," or half

kerosene barrels, which were provided as soon as we got here and which have been used up to the present time. The city authorities hauled these tubs away, but they did not always do so in the proper time. We were obliged to nag at them pretty constantly concerning this matter, but they have lately done very well. Taking everything into consideration, the city of Jacksonville has done well. We have battalion sinks, and I have sometimes observed these tubs full to overflowing. It has been our practice to remove the soil upon which this overflow has taken place and replace it by other earth. The sinks at present are more distant from our mess tents than they were formerly. At first they were distant about 30 yards; now they are fully 50 or 60 yards away from any tents used by the command. These tubs have a decidedly bad odor. When the tubs were removed by scavengers and placed upon scavenger wagons to be carted away, I have seen the contents slopped over and spilled by them, before and after placing them upon the wagon; have sometimes seen this matter scattered along the road. The wagons containing these tubs for a while passed through our own regiment. They came through just before our dress parades, at a time when a great many ladies would be gathered from the city to witness these parades, but I have put a stop to hauling these tubs through our company streets at this hour. It was permitted, however, at other hours. The scavengers from the Second New Jersey (Second Illinois?) and the First Wisconsin also passed along near our sinks at the end of our company streets.

The line of sinks, I should say, is directly west of the regiment. The prevailing winds (from the south-east) did not, therefore, blow from the sinks to the tents, and I have never seen the paper from the latrines or from these tubs blowing through the camp.

The men had bathing facilities; a bath for each battalion, located near and upon the line of the corresponding latrine. The water from these shower baths ran at first into a sand ditch parallel with and near to the line of latrines. The water from the baths percolated through the ground and produced dampness in the camp. The odor from this ditch was very unpleasant. Copperas was used for a while. This ditch was along the line of the railroad (trolley) and to the rear. Along this ditch and within a few inches from it ran, a few inches underground, water pipes supplying the camp, upon which taps for the supply of each company were located. The overflow from these taps ran into the ditch, as also all other water in this locality. Besides the drainage from our own camp, this ditch carried similar drainage from the camps of the Second Illinois on the south and the First Wisconsin on the north, which latter had been having so much fever.

The lowest part of our own ground and of the adjoining grounds was about in the middle of our camp. A little to the south of the middle of the camp ran a

road east and west, leading from the trolley line on the west flank of the regiment to the steam railway on our east flank. This road separated our southern battalion from the other two battalions on the north side. There was a covered drain along this road in connection with a "manhole" near the point where the above-mentioned ditch crossed this road, at the western side of the camp. This covered drain gravitated toward the steam railway above mentioned on the east flank. At first, during almost every heavy shower of rain or rain storm, this manhole would become filled with sand, and the flow of the water into the drain thereby obstructed. This would create a temporary accumulation of overflowing water at this point of the camp. It should be noted here that the soldiers of the Second Illinois would come out to their water taps with their dirty dishes to be washed. We had, therefore, the dishwater and everything else from our neighboring regiments. After the obstruction of the above-mentioned manhole, and the consequent accumulation of water, all that dirty water began to flow down the above-mentioned street separating two of our battalions. The ground remained damp a long time after the rains. Our company streets and the ground around the tents have been a whole sheet of water, which remained so for an hour or two after rains and then sank into the ground. In spite of everything that you can do the men will urinate at night upon the ground in the neighborhood of their tents, and there is a faint ammoniacal odor even in quarters. These rains ameliorate this condition, and I have thought that if we had been on any other class of ground (highly absorbent) we would have had an epidemic. However, the water accumulated in the neighborhood of the above-mentioned ditch by reason of the obstruction in the manhole would gradually percolate into the soil, which latter would become impregnated with the urine and other matters carried with the water of the ditch. It was fortunate, however, that this overflow did not spread throughout the camp, but ran off along the abovementioned street or road.

Our ground was lower than that of any other regiment around us, but, notwithstanding, I reckon we have better health than any of the others. Later we had this ditch boxed. When we came to uncorking nature's jars, as it were, for this purpose, our sick list ran up to 179; but since the ground has become old the sickness has lapsed back. We had an outbreak of malaria, diarrhea, and dysentery when we began boxing this ditch.

Some of the companies of the regiment have been upon provost duty in the city. It is not believed that there was a case of sickness occurring while they were out upon such detached service. About four to six weeks ago Company C went out upon provost duty and remained out two weeks, during which time they were, comparatively speaking, very healthy. "I like to see

these companies go out. It serves a double purpose, because we can air the ground, and, besides, the company gets healthier." Company K is now out upon such duty, and there is no sickness in it. Company A has been on provost duty, I think, since the occurrence of typhoid fever in Company C; it returned to camp only week before last. They were out a couple of weeks and had no sickness among them, except in the case of one man who had been drinking.

We had little or no sickness, comparatively speaking, until about the time the neighboring regiments, the Second Virginia and the First Wisconsin, moved away from their first sites. I think we had our first case of typhoid fever in June, but I do not remember the exact date. We have had considerable malaria all of the time, beginning very soon after we got here. They are not cases of continued fever. A man would get malaria, have a few chills and become anemic, unfitting him for service; then we would send him home, and after awhile he would come back again all right. The malaria was of the intermittent type. There were some cases of remittent fever. The first few cases [of the latter] were of the malignant, congestive type of malaria; at least that was my diagnosis. The cases of remittent fever would continue ill variously from ten to fourteen days before the fever would break, and then convalescence would begin, but they did not recover very rapidly. It would take them some time to get well after a severe case of "malarial fever," but it is my opinion that they were malarial instead of typhoidal fevers, or, I would take it, between the two. I think the grounds we are on are rather of a malarial character, and where you have malaria you do not have typhoid. I believe the former is a protection against the latter.

The above-mentioned outbreak of fevers, diarrhea, and dysentery was more marked in some companies than in others. Companies B, C, and D had more trouble in this respect than the others. They were in the First Battalion, which was nearest to the First Wisconsin on the north; and the companies constituting this battalion, in the order of the proximity to the latter regiment, were A, C, D, and B, the latter being most remote. Typhoid fever first appeared in Company B, and this company suffered with fever more than any other. Cases were not retained in camp long, and could not say whether many of them came from the same tents. We were required to transfer these cases to division hospital within two days if possible. A man would present himself at sick call two or three mornings, when I would send him over to the division hospital. Questioned as to whether he had a theory to account for the greater prevalence of the disease in Company B, the surgeon replied that this company is from one town, Goldsboro. They tendered 84 men for mustering, and 84 men were accepted for the service. There have been some desertions from that company—

more than all the other companies together. The men of this company were as highly intelligent as those of others, and their average strength and fitness were as good as any I have ever seen. I am inclined to think the men were below the average social status, and I do not believe that they had more money to spend than did those of other companies; I doubt if they had as much.

At the time our sick list suddenly ran up to 179, as above stated. It was brought about in these two companies by the cooking of some beef which should not have been cooked. The day after that beef was cooked "it knocked 21 or 22 men silly." These men were from Companies C and B on the north. "I have been watching to see if it would give rise to any typhoid fever, and it has not as yet." This incident occurred last week (the testimony was taken August 29), and most of the men are back for duty. It gave them a severe diarrhea, disqualifying them for duty for a few days. (Note by the board.—Mark the inconsistency between date of this "cooked-beef incident" and the previous history of the sudden outbreak of fever, diarrhea, and dysentery following the unearthing of ground for the boxing of the drainage ditch.) Company B received recruits, as did all of our companies. We came here with 84 men to the company and recruited up to 106. The surgeon did not know whether typhoid fever has appeared among the recruits. What small amount of typhoid fever we have had is scattered over the regiment pretty generally, but Company B has suffered most. Very recently a few cases have developed in Companies C and D, which are located near Company B. "Last week when I found a great number of cases of sickness and diarrhea in Company I, on the south of this trolley street, the cook of that company reported to me a bad condition of the meat supplied. The latter said that he did not send for the physician or meat inspector, for he did not think it would amount to much, and cooked the meat. He did not want to be always kicking." Company I of the south battalion and Company F of the middle battalion were separated from each other by the above-mentioned street, along which flowed the previously mentioned overflow of water accumulated at the junction of this street with the previously mentioned drainage ditch running along the west flank of the regiment. There has been a great deal of diarrhea and malaria in these two companies, and it should be remarked also that Company F, on the north side, has not had a great deal of discipline. Before they had put in the drainage and tore up the earth, and before the rain water overflowed, they were almost perfectly healthy companies. "They began to suffer with diarrhea and dysentery, I should judge, a couple of weeks after the occurrence of the overflow." He had attributed their sickness, however, to the cooking of spoiled meat two times. "I am of the impression that these two companies suffered more from

enteric disturbances than any others, excepting C (B?), where they had also cooked bad beef."

(Note by the board.—It should be remembered in this connection also what has been said respecting the temporary turning off of the general water supply for a short period, and that this temporary interruption occurred after the overflow, three or four weeks previous to the taking of this testimony.)

Questioned as to whether he had given any consideration to the amount of typhoid fever among the First Wisconsin, Major Wilder replied that he had, being well acquainted with the surgeons of that regiment. He thought "they got their dose from those numerous little negro stands (shacks), where they got pies and the sort of stuff that is kept in these shanties for sale. There were eighteen or twenty of those shanties in the neighborhood. I do not know where their milk came from, but I think the men got the dose in the milk." The men of that regiment were not restricted from going out of the lines to visit these shanties. As has been already stated, our men were not allowed such freedom. The First Wisconsin officers never exercised the same discipline that we did. Questioned as to whether any particular company of that regiment more frequently resorted to these shacks, Major Wilder replied that he believed the trouble to be with the company that lay nearest to the "gravel road."

ABSTRACT OF A COMMUNICATION FROM THE COMMANDER OF COMPANY C, FIRST NORTH CAROLINA VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. Jesse C. Bessant, commanding, stated as follows: The arrangement of companies in the camp at Jacksonville, Fla., was as follows: First Battalion, Companies A, C, D, and B; Second Battalion, Companies E, G, H, and F; Third Battalion, Companies I, L, M, and K.

This company was on provost duty in the city of Jacksonville, from June 25 to July 26. The men of this company were chiefly from a rural population. Their intelligence was medium, they were prudent, and their financial status was above the average.

There was but 1 case of genuine typhoid fever in my company.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

May.—(Camp Grimes, Raleigh, N. C.) Mean strength averaged for twenty-seven days: Officers, 50; enlisted men, 933; total, 983. Admitted from command, 150; total to account for, 150. Of 150 completed cases 145 returned to duty; 5 transferred to other hospitals.

Abstract of remarks by Maj. Hillory M. Wilder, surgeon:

At Camp Grimes, Raleigh, N. C., May 5 to May 22. En route, 556 miles by rail, to Jacksonville, Fla., Camp Cuba Libre, May 23. From May 23 to May 31 stationed at Camp Cuba Libre.

General character of disease: Acute bronchitis, acute diarrhea, dysentery, and constipation. Causes: Change of habits, diet, and climate.

The health of the regiment and sanitary condition of the camp good.

June.—(Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 47; enlisted men, 932; total, 979. Admitted from command, 132; total to account for, 132. Of 131 completed cases 45 returned to duty and 86 transferred to other hospitals. Remaining on sick report: In quarters, 1.

Abstract of remarks by Maj. H. M. Wilder, surgeon:

General character of disease: Malarial fever, intermittent, quotidian, measles, and mumps. The contagious diseases are promptly isolated.

July.—(Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 50; enlisted men, 1,201; total, 1,251. Admitted from command, 148; total to account for, 148. Of 143 completed cases 24 returned to duty; 15 discharged for disability; 1 to insane asylum; 102 to other hospitals. Remaining on sick report: In quarters, 6.

Abstract of remarks by Maj. H. M. Wilder, surgeon:

Regiment in Camp Cuba Libre during the month. The health of the regiment is good. Prevailing diseases: Malaria, measles, and mumps. The contagious diseases are promptly transferred to division hospital for isolation. Sanitation of camp is good.

August.—(Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 50; enlisted men, 1,211; total, 1,261. Remaining from last month, 6; admitted from command, 278; total to account for, 284. Of 260 completed cases 181 returned to duty; 6 discharged; 1 to asylum; 72 transferred to other hospitals. Remaining on sick report: In quarters, 24.

Abstract of remarks by Maj. H. M. Wilder, surgeon:

We have had a good deal of diarrhea and enteric troubles, as well as malarial fevers. Have raised the tents from 1 to 2 feet all around the ground. We think that this will materially benefit the command, as it prevents the soldiers from sleeping on the ground.

September.—(Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 47; enlisted men, 1,207; total, 1,254. Remaining from last month, 24; admitted from command, 514; total to account for, 538. Of 527 completed cases 331 returned to duty; 36 discharged; 160 transferred to other hospitals. Remaining on sick report: In quarters, 11.

Abstract of remarks by Maj. H. M. Wilder, surgeon:

The sickness in camp is diminishing steadily since the city water has been substituted for the Panama water.

October.—(Jacksonville, Fla., and Savannah, Ga.) Mean strength averaged for thirty-one days: Officers, 45; enlisted men, 1,195; total, 1,240. Remaining from last month, 11; admitted from command, 306; total to account for, 317. Of 306 completed cases 263 returned to duty; 15 discharged; 28 transferred to other hospitals. Remaining on sick report: In quarters, 11.

Abstract of remarks by Leona M. Archy, first lieutenant and assistant surgeon in charge:

Broke camp at Camp Cuba Libre, Jacksonville, Fla., October 24, 1898, and moved to camp near Savannah, Ga., reaching Savannah at 7 p. m. October 25.

The men were made as comfortable in car sheds at station as possible, and pitched camp on the morning of the 26th. No regular sick call could be made, as drugs were packed up, except small boxes the stewards could carry. The prevailing sickness now is jaundice of a simple type and malarial troubles. Health of command is steadily improving since moving.

November.—(Savannah, Ga.) Mean strength averaged for thirty days: Officers, 45; enlisted men, 1,177; total, 1,222. Remaining from last month, 11; admitted from command, 220; total to account for, 231. Of 215 completed cases 168 returned to duty; 6 discharged; 41 transferred to other hospitals. Remaining on sick report, 16.

Abstract of remarks by Maj. H. M. Wilder, surgeon:

The prevailing sickness in camp is catarrhal jaundice, caused chiefly by malaria. Coryza is also prevalent, though of a mild type. The general health of the command is very good.

December.—(Camp Columbia, Habana, Cuba.) Mean strength averaged for twenty-eight days: Officers, 50; enlisted men, 1,072; total, 1,122. Remaining from last month, 23; admitted from command, 128; total to account for, 151. Of 140 completed cases 70 returned to duty; 8 discharged; 62 transferred to other hospitals. Remaining on sick report, 11.

Abstract of remarks by Maj. H. M. Wilder, surgeon:

Much of the sickness was caused by malaria.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FIRST NORTH CAROLINA VOLUNTEER INFANTRY.

Brief outline of the medical history.—This regiment assembled at the State capital, Raleigh, on the 1st of May, 1898, was mustered by the 11th, and remained at the State camp there until the 22d of that month, when it left for Camp Cuba Libre by rail, arriving there the next day. On the 23d of May the command reached Jacksonville, Fla., was assigned to the First Brigade, Second Division of the Seventh Army Corps, and went into camp with the Second Illinois and Second New Jersey, the two other members of this brigade, upon a site located in the suburb of Springfield, within the corporate limits of the city of Jacksonville. It was still upon this camp site at the time of the inspection by the board, about the 1st of September, and we have no knowledge that the regiment changed ground before it left Jacksonville, on the 24th of October, for Camp Onward, near Savannah, Ga., where it arrived the next day by rail. The command remained in Camp Onward through November and part of December. At the end of December it was in Camp Columbia, not far from Habana, Cuba. But the medical records do not fix the date of departure from Savannah, Ga., or

arrival at Habana, Cuba. We may surmise, however, that the movement of the regiment took place near the time of a similar move of its associate in this brigade, namely, of the Second Illinois, which sailed for Habana in detachments on the 10th and 12th of December, 1898. (See history of the latter.) Although the First North Carolina was not mustered out of the service of the United States until April 22, 1899, at Savannah, Ga., the medical history as given by the board ended on the 31st of December, 1898.

The medical history of this regiment hence covers a period of eight months. Of this time, twenty days were passed at the State camp; one day en route by rail to the national camp; from May 23 to October 24, or one hundred and fifty-four days, in the national camp at Jacksonville, of which at least the first one hundred days, and possibly, all were passed upon one and the same camp site without change.

The First North Carolina furnishes no indication of having had any typhoid fever while in its State encampment. It would seem that the first suspicious attack of fever in the regiment occurred fourteen days after arrival at Jacksonville and the first case of probable typhoid developed four days later. It is therefore doubtful if this regiment came to the national camp already bearing with it the infection of typhoid fever, although it is certain that the disease made its appearance suspiciously soon thereafter.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the commencement of attacks were recorded as closely as they could be ascertained:

[First North Carolina Volunteer Infantry; mean strength, 1,164.]

Month.	Intestinal disorders.				Febrile attacks, malarial, etc.		Typhoid attacks.		Deaths from disease.
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	
May.....	71	6	.....	77	8	.....	.....	.....	.....
June.....	10	1	.....	11	23	7	3	3	.....
July.....	22	3	.....	25	37	6	1	21	25
August.....	96	27	7	130	16	1	5	22	28
September.....	152	32	1	185	30	16	14	60	90
October.....	72	47	8	127	5	3	17	17	37
November.....	7	3	1	11	16	3	5	19	27
December.....	.....	.....	1	1	5	.....	1	5	6
Total.....	430	119	18	567	140	36	46	147	229
									16
									4

A rectification of the total number of so-called long malaria as given in the above summary table, by months, should be made by reducing the total of 36 to 34, thus

requiring a corresponding reduction of the number of total probable typhoid attacks from 229 to 227.

The above tabulated deaths from disease, by months, were distributed among the companies of the regiment as follows:

	Company.										Band.	Total.
	A.	B.	D.	E.	F.	G.	H.	I.	K.	M.		
Typhoid.....	2	2	3	2	.....	2	1	1	1	.....	1	16
Other diseases.....	.....	.....	.....	.....	1	1	.....	.....	.....	2	.....	4
Total.....	2	2	3	2	1	3	1	1	1	2	1	20

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders, in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such other attacks.

Combinations of typhoid fever in the First North Carolina.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	11	19	6	12	6	3	7	9	8	6	5	6	1	99
Probable typhoid (uncombined).....	1	5	3	2	1	1	1	4	.....	2	1	3	.....	24
Typhoid beginning in diarrhea.....	.....	1	2	4	1	.....	4	.....	2	.....	.....	1	.....	15
Probable typhoid beginning in diarrhea.....	.....	.....	.....	.....	.....	.....	1	3	.....	1	.....	.....	.....	5
Typhoid preceded by diarrhea.....	1	3	1	3	5	3	1	1	1	3	2	2	.....	26
Probable typhoid preceded by diarrhea.....	.....	.....	1	1	2	1	2	1	3	.....	.....	1	.....	12
Typhoid followed by diarrhea.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	2
Probable typhoid followed by diarrhea.....	.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	2
Typhoid preceded by malaria.....	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	3
Probable typhoid preceded by malaria.....	.....	.....	.....	1	.....	.....	.....	2	.....	.....	.....	.....	.....	3
Typhoid followed by malaria.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Combinations of three diseases.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Total certain typhoid.....	12	24	9	20	12	7	13	11	12	9	8	9	1	147
Total probable typhoid.....	1	6	4	4	3	2	5	10	3	3	1	4	.....	46
Total probable and certain typhoid.....	13	30	13	24	15	9	18	21	15	12	9	13	1	193

Combinations of continued or malarial fever in the First North Carolina.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	3	5	9	9	7	6	8	7	12	4	7	8	2	87
Short malaria preceded by diarrhea.....	1	.....	.....	.....	1	.....	2	2	1	2	1	.....	.....	10
Short malaria followed by diarrhea.....	3	2	1	2	.....	2	.....	1	.....	.....	3	1	.....	15
Diarrhea, short malaria and diarrhea.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	1	1	.....	4
Short malaria, diarrhea and short malaria.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	2
Two attacks short malaria.....	1	.....	2	.....	.....	.....	.....	.....	2	.....	1	.....	.....	6
Short and long malaria.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Long malaria (uncombined).....	1	4	4	1	5	1	1	3	2	3	1	1	1	28
Long malaria preceded by diarrhea.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	1	.....	.....	4
Long malaria followed by diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1
Total short malaria.....	9	8	15	15	8	10	11	13	18	7	14	10	2	140
Total long malaria.....	1	5	6	1	5	4	1	3	2	4	2	1	1	36

Totals include malaria in typhoid combinations.

Intestinal disorders in the First North Carolina.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Single short diarrhea...	15	17	26	29	22	19	19	14	23	15	17	13	.....	229
Two attacks short diarrhea...	4	3	...	6	3	6	4	1	4	2	7	1	.....	41
Short and long diarrhea...	2	2	1	1	2	2	1	1	...	2	1	...	.....	15
Short, long, and prolonged diarrhea...	...	...	...	...	...	...	...	...	...	...	...	1	.....	1
Short and prolonged diarrhea...	...	...	...	1	...	...	2	...	...	...	...	1	.....	4
Single long diarrhea...	10	2	6	2	6	6	11	8	6	4	8	5	.....	74
Long and short diarrhea...	2	...	...	1	1	2	...	1	...	...	...	...	.....	7
Two attacks long diarrhea...	...	...	...	...	...	2	...	...	...	2	...	...	.....	4
Single prolonged diarrhea...	2	...	1	...	...	1	...	...	...	1	1	3	.....	9
Prolonged and long diarrhea...	...	...	...	...	...	...	1	...	1	...	...	...	.....	2
Total diarrhea...	49	37	41	62	48	62	57	33	44	41	56	37	.....	567

Totals include diarrhea in malaria and typhoid combinations.

The records of sickness in this regiment were found to be more or less incomplete and to some extent conflicting. By way of illustration: The medical records relating to this regiment reveal 13 cases of intestinal disorder, 33 cases of so-called short malaria, etc., and 8 cases of so-called long malaria, etc., whose final disposition is not recorded. How many of these incomplete cases were really typhoid fever and should have been added to the total given in the above summary table it was, of course, impossible for us to estimate. That there were at least some, possibly many, we think can not be reasonably questioned. Moreover, there are 7 cases which we have been unable to tabulate for lack of sufficient data. Furthermore, one of the fatal cases of typhoid does not enter into the foregoing tabular statement at all, because the sole record we have of this man is that from the Adjutant-General's Office certifying to his death by typhoid fever on the date given. The above tabular statement should, therefore, in our opinion, be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the First North Carolina Volunteer Infantry as a member of the First Brigade, Second Division, may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Raleigh, N. C., from May 1 to 22; it was in the national camp at Jacksonville, Fla., without changing site before the 1st of September, if at all, from June 23 to October 24; it was in Camp Onward, near Savannah, Ga., from October 25 until about the middle of December, when it sailed for Habana, Cuba, went to Camp Columbia, near Habana, and was there at the end of December, 1898. It was mustered out at Savannah, Ga., April 22, 1899. The initial date of the first probable attack of typhoid fever was June 6 and of the first certain attack of typhoid fever was June 27. It is therefore a matter of doubt if this regiment was already carrying the infection of typhoid fever when it arrived in the national camp at Jacksonville, Fla. The medical history of

this regiment as given by the board covers a period of eight months (from May 1 to December 31, 1898), and is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorder, 568; of so-called short malaria, etc., 141; of so-called long malaria, etc., 34; of probable typhoid fever, 46; of certain typhoid fever, 147; total attacks of probable typhoid fever (long malaria, etc., included), 227.

(c) Total deaths from typhoid fever, 16; total deaths from all diseases, 20; mortality per cent of total attacks of probable typhoid, 7.04; of certain typhoid, 10.88; per cent of typhoid deaths to all deaths by disease, 80.

(d) The mean strength was 1,164. The per cent of typhoid morbidity to mean strength: As to total probable typhoid attacks was 19.50, while the average for the brigade was 25.96; as to total certain typhoid attacks was 12.62, while the average for the brigade was 17.14. The number of typhoid deaths per 1,000 of mean strength was 13.74, while the average for the brigade was 18.46, and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the First North Carolina:

Disease.	Individuals.	Average age.
Short intestinal disorders.....	271	22.4
Long intestinal disorders.....	77	23.6
Prolonged intestinal disorders.....	13	26.7
Total intestinal disorders.....	361	23.5
Short malaria, etc.....	109	22.9
Long malaria, etc.....	25	21.8
Probable and certain typhoid attacks.....	161	23.1
Total probable and certain typhoid and long malaria.....	186	22.9
Grand total of all above classes.....	656	23.3
Eleven soldiers who died from typhoid fever.....	.....	23.5

For comparison of these average figures with similar data relative to other regiments in this brigade and division we refer to the general tables treating of this subject at the end of the Second Division of the Seventh Army Corps. (See also similar tables relating to certain regiments of the Second Army Corps at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) The arrangement of the companies in battalions in this regiment seems to have been in the first camp at Jacksonville from north to south, as follows: A, C, D, B in the north battalion; E, G, H, F in the middle battalion; I, L, M, K in the south battalion. A diagram map of this regiment furnished by Lieut. J. S. Wilson, assistant surgeon, U. S. Army (with the aid of

the regimental surgeon and the commandant of the Second Division Hospital at Jacksonville), shows that the battalion street between the south and middle battalion was a road, Company F, of the middle battalion and Company I of the south battalion, being located, respectively, on the north and south side of the road. (Refer to the foregoing testimony of the regimental surgeon concerning the surface drainage of the regiment in connection with this battalion street.) These dissimilarities in the course of the company epidemics in the First North Carolina would appear to be on their face incompatible with the assumption of a common, simultaneous, and more or less constantly acting agency as the chief means of the propagation of the epidemics.

(b) As in other regiments of this division, the epidemics in the companies of this regiment showed frequent greater or less exacerbations in their course, and the intervals between these exacerbations as a rule were more or less coincident with the average period of incubation of typhoid fever. (A full discussion of this point will be found in the general remarks under the Second Division of the Seventh Army Corps, as also in the general remarks under the Second Army Corps at Camp Meade.)

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) Attention is called to the course of the disease in Companies F and I, located, respectively, on the north and south side of the road dividing the south and middle battalions, as above mentioned, and to the remarks of the surgeon of the regiment in this connection. In the remarks of the regimental surgeon it is stated that the lowest point of the adjoining camps of the Second Illinois, First North Carolina, and First Wisconsin was located somewhere near the rear end of the camp of the middle battalion of the First North Carolina, and that the surface drainage of these three camps tended to concentrate at this point, especially by the aid of a continuous ditch bordering the west flank of each of these regiments. The surgeon describes a pretty constant dampness existing at the end of the battalion camp of this regiment, especially near this locality, and speaks of an approach to an inundation here during the times of heavy rainfall. Doctor Wilson's diagram map, above referred to, shows the position of the tents in which, in the opinion of the regimental surgeon, typhoid fever cases had occurred previous to September 1. The map shows that most of the tents affected were in Companies D, B, and E, of the north and middle battalions. The only one of these companies whose tents were at the kitchen end of the line of the company who were seriously affected was Company B. It may be remarked in passing, as to this diagram map, that with the exception of Company B three-fourths of the tents infected with typhoid fever as platted were in the half of the regimental camp most remote from the battalion sinks.

(b) The testimony concerning the detached service of Company C is more or less conflicting. It appears that this company was detached from the regiment on provost-guard duty at the corps headquarters in the city of Jacksonville from June 28 to July 7. It seems to have been detached again on provost-guard duty (location not stated) about August 3 to 17. In a communication from the commanding officer of this company the captain says: "This company was on provost duty in the city of Jacksonville, Fla., from June 25 to July 26." It therefore seems that the company was separated from the regiment almost constantly between June 25 and August 17. It therefore appears probable that through its long detached service this company almost altogether escaped for the time being whatever chance of infection may have existed in the regimental camp during that period. By reference to the graphic chart it is seen that the other companies of the north battalion, of which Company C was a member, became more or less infected with typhoid fever during the period of detachment of Company C, and that the epidemic in Company C did not begin until more than a fortnight after the return to camp at the end of its last detached service, on the 17th of August. Company K went out on provost-guard duty about the last of August, but the locality or exact time of this service is not given. Reference to the graphic chart shows that although there were 3 cases of typhoid fever in this company anterior to the 8th of July, the epidemic in the company did not begin until about the 25th of August, at first with a few scattering cases. It is impossible to arrive at any definite conclusion concerning the effect of detached service of this company on account of indefiniteness of the date of the service. Company M was detached from the regiment on provost-guard duty at corps headquarters in the city of Jacksonville from August 30 to September 10. Since this company had only a few scattering cases of typhoid fever and no defined epidemic, it is difficult to estimate the value of any influence of this detached service upon the sickness experienced by the company. Company A was on provost-guard duty in the city of Jacksonville at corps headquarters about the 6th to the 20th of August. With reference to the detached service of this company it may be remarked that the graphic chart shows 3 scattered cases of typhoid fever in this company anterior to the beginning of the detached service. It appears that there were 2 more cases on the 6th and 10th of August, respectively. The next case of typhoid fever occurred on the 28th, followed by 1 more on the 1st of September and a few more scattering cases after that, beginning in the middle of September. It is therefore impossible to perceive any special influence of the detached service of this company. Company B was detached from the regiment on provost-guard duty in the city of Jacksonville from September 15 to 20. Reference to the graphic chart will show that this company had already experienced a considera-

ble epidemic of typhoid fever prior to the date of the commencement of this detached service and that the epidemic continued until the last sharp outbreak of 4 cases between the 25th and 29th of September, when the epidemic ceased entirely, although there were 3 or 4 cases scattered through October, November, and December. It is difficult to estimate the full value of the detached service of this company upon the course of its epidemic, although reinfection appears to have ceased during the time of this service and to have been not renewed again until long after rejoining the regiment. In this connection it should be noted, however, that a very marked fall—in fact, decided interruption—of typhoid fever throughout the regiment occurred about the end of the group of 4 cases just mentioned. For this reason it may not be safe to say that the cessation of the epidemic in this company was entirely due to this separation from the regiment.

(c) In the testimony of the regimental surgeon reference is made to ptomaine poisoning from bad beef affecting Companies B and C. This incident occurred about the last week in August. The surgeon says: "At the time our sick list suddenly ran up to 179, as above stated, it was brought about in these two companies by the cooking of some beef which should not have been cooked. The day that that beef was cooked it knocked 21 or 22 men silly. These men were from Companies C and B on the north. I have watched to see if it would give rise to any typhoid fever, and it has not as yet." (This testimony was taken August 29.) By reference to the graphic chart it will be observed that there was a group of 7 cases of typhoid fever occurring in Company C from the 7th to the 16th of September, and that a group of 9 cases of typhoid fever occurred in Company B during the same time. These two outbreaks were within ten or twelve days of the estimated date of this ptomaine poisoning. (See similar incidents in the histories of the Second Illinois, Thirty-fifth Michigan, and other regiments.)

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation in this disease from data obtained from two different sources, and we have found in the general averages a striking coincidence in the figures thus obtained:

(a) This regiment furnishes data from only one of these two sources—the period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid-fever attacks. The First North Carolina furnishes 6 examples of diarrhea preceding typhoid fever by intervals which could be fairly regarded as measuring the period of incubation. The average length of the interval or period of incubation in these 6 cases was eight days.

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For similar data concerning other regiments, see tables of the Second Division, Seventh Army Corps, relative to this subject, and similar tables for the Second Army Corps.

FIFTIETH IOWA VOLUNTEER INFANTRY.

Second Brigade, Second Division, Seventh Army Corps.

ABSTRACT OF SURGEON'S TESTIMONY BEFORE THE BOARD.

[Maj. Charles S. Grant, regimental surgeon.]

Des Moines, Iowa.—The regiment was assembled at Des Moines, Iowa, and encamped upon the State fair grounds near that city from April 26 to May 17, when it was mustered in. During this time we were supplied with the city water and employed the dry-earth system for the disposal of feces. The closets were emptied once a day, and we used a great quantity of lime. The fecal matter was not burned, but was carried to the city dumping grounds.

We had no typhoid fever while at Des Moines, nor any great amount of diarrhea or dysentery, being troubled chiefly with mumps and measles.

Jacksonville, Fla.—Soon after being mustered in at Des Moines the regiment arrived at Jacksonville, Fla., on the 24th or 25th of May, and went into camp there just north of the First Wisconsin; that is to say, north of the "gravel road." Our water supply was already installed (being furnished in iron pipes under pressure from the city of Jacksonville), and from the first there was no necessity of the men drinking any other than this water while in camp, and as a matter of fact no other water was used. The latrines were also installed. The system of the disposal of feces was that of the "tubs" in the latrines (these tubs being half whisky or oil barrels furnished with rope handles). Our latrines were west of the regiment, with the exception of the officers' sink, which was north. The latrines of the First Wisconsin were on the same side as those of our regiment and on the same line with them.

The scavenger wagons removing the "tubs" from our latrines usually passed along the west and then along the north flank of our regiment, then turned (south) and passed through the encampment of the First Wisconsin, along the "shell road." Was not positive that the same wagons emptied the sinks of the Fourth Virginia and the Forty-ninth Iowa, but noticed that after leaving the encampment of the First Wisconsin regiment they turned in the direction of those regiments.

As to the tubs, it should be remarked that they several times overflowed, and each morning they were found in this condition the matter was reported to the health officer of the city of Jacksonville, under whose direction the contents of the latrines were removed, who would correct the matter for a week, and then Sunday would come and they would not be emptied until Monday, and so on. We never had sufficient tubs. They were frequently overflowing, and after

being loaded upon the wagons for emptying the contents would splash over and spill along the ground.

The mess tents were at the rear end of each company street, and the latrines were not more than 50 yards farther to the rear. Paper was frequently blowing through the camp, but Surgeon Grant could not say if this was soiled paper from the latrines.

Shaeks for the vending of pies, soft drinks, etc., were located along the "shell road" near the First Wisconsin, and our men could easily go there; but I do not think they were generally patronized, for we had a sutler for a while. The latter furnished what milk was used. It was cows' milk, and was consumed to some extent in the regimental mess; but I do not believe that it was used generally by the men of the regiment.

In response to a question the surgeon stated that he did not know of the water supply being turned off temporarily from the encampment at any time by the water department of the city of Jacksonville for any reason. There was always plenty of water, and, as far as he knew, water flowed always when the taps were opened.

The regiment first came to Jacksonville with Sibley tents, with 18 to 20 men in a tent. The men slept upon the ground for a month before floors were obtained.

The regiment did not move from this first camp site until the 1st of August.

Typhoid fever first appeared about the middle of June in Company L. This was the second company from the right and the eleventh company from the left, but it is not the company which has had the most typhoid fever. My theory in accounting for the first case of typhoid fever is that the subject had been bathing in the St. Johns River for two weeks. After the development of this case I went to the point where he bathed and found the shore covered with a mass of rotten hyacinth growth. In order to swim at that point the bathers would have to wade out a hundred feet through that stuff. After learning this condition of the river bank orders were issued that no man should bathe there. There were probably others from our regiment and other regiments who had been bathing at this point. I believe the disease to be pretty well scattered throughout the regiment. We would get a case from one end of the line one day and the next day from the other end. The surgeon could give no explanation why at first Company L furnished one-half the cases of disease. In truth he had not noticed that this had been the fact. They had been obliged to send the cases of severe illness to the division hospital within twenty-four or forty-eight hours of their development.

Company B was from Davenport, Iowa. It was the crack company of the regiment. The men were in good social position and had more money to spend than any other company.

Companies A, B, and D have been on patrol duty,

Company A being detached upon such service in the city of Jacksonville before the outbreak of typhoid fever. Company B went out upon such service into the woods east of the camp the 22d of August, 1898. Company D was also on patrol duty in the city of Jacksonville.

We have had a great many cases of diarrhea and some of dysentery, the diarrhea beginning as soon as we got here. Did not remember a case of diarrhea occurring before coming to camp at Jacksonville. This intestinal trouble was pretty well scattered among the various companies, not being especially marked at any time in Company B. I attribute this diarrhea to camp life and change of food, effects which are noticed sometimes in our National Guard encampments. Hereupon a member of the board remarked: "I should think it was about time they were getting used to camp life and food, having been subject to these influences since the 26th of April."

There has been some malarial fever of the remittent type. We keep the cases two or three days and then send them to the division hospital, where they remain from one to three weeks, and then they come back and go into sick quarters in camp. This was the case formerly, but now instead of coming back to camp and going into sick quarters there they go to Pablo Beach, Fla.

Many of these cases come back to us from the hospital with the diagnosis of malarial fever. This statement applies up to the end of August. There have been 10 deaths from typhoid fever. I do not know the total number of cases of typhoid fever, but I should think half the number of fever cases were real typhoid. Replying to an inquiry as to his theory in regard to the origin of typhoid fever, Surgeon Grant said that as for the later cases he thought it came from the flies; as to the earlier ones, he thought originally the first case was due to river bathing and the other cases to the swampy condition of the ground. On the outside and around a great many of the camps, even in headquarters, there was a half foot of water after rains.

In our new encampment our regiment is located with reference to the First Wisconsin practically as before. They are within 50 yards of us. Typhoid or continued malarial fever has been on the increase since we came over here. It slacked up for two or three days a couple of weeks ago and then started up again, and we are still having a good many cases.

[Maj. J. W. Harriman, surgeon in charge.]

Des Moines, Iowa.—Have been on duty with the regiment since April 26. The regiment was assembled and mustered in at Des Moines. Aside from colds contracted by the men in camp, the health of the regiment in that camp was good. There was no typhoid fever developed in that camp, where we were about a month.

Jacksonville, Fla.—We arrived at Jacksonville the 25th of May. Upon arriving the regiment joined the Second Brigade of the Second Division and went into camp "on the south side of the road after turning left on the street-car line on Main street." Doctor Vance came here the 26th of May and is still with the regiment. I am going home. I have been major-surgeon of the regiment only from the 9th of August. Doctor Robinson was originally surgeon of the regiment. Soon after coming here he was made division surgeon and left the regiment. He contracted typhoid fever at Fort McPherson, having left here July 20, and developed typhoid about the middle of August.

Our water supply was the same as the other regiments—direct from the hydrants, I suppose, of the city water plant. The water is kept in covered receptacles near the mess tents, about 50 yards from the sinks, at a guess. There is a dirty spring located at one side of our camp beyond our lines, which is so filthy and is surrounded by so much rubbish that no man would think of drinking it. It is a flowing spring with reasonably clear water. I have been down there several times and have seen no footsteps leading to it nor observed any other indication of anyone drinking there. I am sure that the men have used no other water while in camp than that of the general water supply.

The disposal of excrement is as follows: Latrines are supplied with half barrels and emptied daily. In some few instances, however, they have not been emptied every day. Chloride of lime has been regularly used in the tubs, and sometimes copperas, but the fecal matter is not covered and the flies are troublesome. The latrines are inspected by the officer of the day and the regimental surgeon in most instances. I have frequently inspected the latrines. I have found their condition reasonably clean, but giving off considerable odor, notwithstanding the fact that chloride of lime is placed in the tub, under the direction of the officer of the day. This has been carefully and regularly done since the 1st of July. Previous to that time we had difficulty in getting tubs enough, and I do not think we were able to get chloride of lime until we made several attempts. At the present time (August 28) we have quite a stock on hand. We used all the chloride of lime we could get prior to the appearance of typhoid fever, but when we first came here could not get sufficient to use it daily. Notwithstanding the attempt at disinfection of tubs, they are still foul smelling. In some instances the tubs have been full and overflowing, especially one in the corner of each sink which the men used for urination. They seem to prefer that particular tub for that purpose. "I have seen the contents of these tubs spill out as they were being taken away." The contractor removes these half barrels on wagons and puts in empty tubs in their places, so that there are tubs in the latrines at all times. The tubs are not usually

emptied into receptacles upon the wagons at the sinks, but I have seen them do this sometimes. The scavenger wagons are usually much soiled with urine. These tubs are carted away upon the scavenger wagons and emptied into a sewer, and there cleaned at a point between the main street and the railroad, about a half mile distant. Our camp is on the left of the street railway. These tubs sometimes lose some of their contents in handling and where the ground is rough over which the scavenger wagons move. "I have seen this happen in a few places. I have also seen it occur that where there would be only one negro with the wagon he would dip the contents from the tubs in the latrines because he could not handle them himself."

This splashing over of the contents of the tubs occurred along the ground in the camp and on the road after they had left the camp, particularly within the limits of the camp. It is not meant, however, that this happens every time. The latrines are arranged as battalion sinks. I can not positively say how many tubs were used to a battalion, but I think about twenty, half of them being in use at a time. That is about thirty in use by a regiment at one time. In the old camp the sinks were on the west side of the camp, and on the south side in the new camp. And in the latter the sinks are much closer to the mess tents than in the former. The flies have always been troublesome. I do not remember a time when we have been free from swarms of these flies, but I do not think that they are now so numerous as they were. We were camped beside the First Wisconsin in the old camp, and are now beside them again in the new, and on the leeward. Their sinks are now farther from their own kitchens than from our kitchens. We were obliged to put our sinks close to theirs, and following the lines we had to locate our sinks close to our mess tents, within 50 yards of the latter; not so far off but that we get an odor from the sinks; not at all times, however. When they were emptying the tubs this odor would be perceptible farther away than the mess tents. The officers' sink is well removed, and that of the guardhouse also. In the old camp it was not customary to find much loose paper blowing around. There is now some of that kind of paper found blowing around the camp, but whether this comes from our latrines or from those of the First Wisconsin I can not say. The prevailing wind is from the south.

In the old camp there were a number of shacks for the sale of lemonade, etc. After we moved to this camp there was a sutler's tent, but it was not particularly well patronized. I have not been able to trace the origin of typhoid fever to the sinks or to anything. I had thought that perhaps the men who were affected might be drunkards, but upon inquiry found that they were not. Some of the best soldiers and best men who have been most healthy are now sick.

Milk not freely used. What is consumed is mostly condensed milk; practically, there are only a very few instances where the men have used milk.

The regiment was first supplied with Sibley tents. Afterwards there was an addition of smaller tents. Some of the men erected wooden shacks to live in. In the smaller tents (A wall tents) there were four men to a tent. The men have not slept upon the ground so far as we could prevent it, but at first most of them were upon the ground. Lately they have not slept upon the ground in many instances. I frequently called attention to the fact that the men should be provided with floors. "I think our first cases of typhoid were lying on the ground."

Typhoid fever developed, I should say, in the early or middle part of July. There are now about 70 cases of typhoid fever in the regiment; not confined to any company, but scattered. Can not say that the fever is in every company. Company H is on the right and Company K on the left. We have had cases in these. Unable to say how the typhoid originated. "I think it may be due to the heat and the changed conditions of food and sleep." There is another occasion, which is that the filth, dropping from the wagons, may have blown in from the road. Before the 1st of July we were to the north of the First Wisconsin, and typhoid fever was in that regiment. The prevailing wind was from southeast to northwest. We have had more typhoid since we moved to the present camp. Typhoid fever began within two weeks to twenty-five days after we moved. Our sick report hopped up from 47 to 147. We got the same air in the new camp. The First Wisconsin was south of us. They moved Friday and we moved Monday.

There was no sudden outburst in any company, but cases occurred all along the line. It was, however, not true typhoid. The affected had pain in the back and jaundice and would make a man think of yellow fever. Very few of them had any tendency to inflammation of mucous membranes. All the cases we have lost have been of typhoid fever. There have been seven or eight deaths, in some of which cases autopsies were made and ulceration of the intestines was found in some of the latter. Could not say whether in any of the autopsies ulceration was absent. The first man died with a temperature of 102° , having been sick twelve days. This man started at a hotel with a temperature of 105° , and a boy there swore it was 106. I have seen it myself at $105\frac{1}{2}$. The temperature of this man now is close to normal. A case in Company B, now getting along fairly well in division hospital, had intestinal hemorrhage. Besides, there are a few cases such as we would expect, like cholera morbus and simple diarrhea. Typhoid is now (August 28) on the increase. We have 83 people in hospital. Of these probably 50 are typhoid cases. I do not mean that they are plain typhoid cases, but I presume if they died there would be that many of

them found to be typhoid. Two of the officers had typhoid. One is now out and the other is convalescent. I may not be able to diagnose a case of typhoid fever in two days, but this is what I am supposed to do. Fever cases are not treated in the company tents unless they are simple fever. But we make mistakes, and if they are simple fevers we can not tell it in two days. We have to send them to the hospital, and we make mistakes that way. We send cases to the hospital that come back almost immediately.

There have been a few cases of true malaria and a good many cases where they had sweating, etc. There have been very few cases of diarrhea and dysentery.

SUPPLEMENTARY TESTIMONY OF MAJOR HARRIMAN, AFTER HIS CAREFUL INVESTIGATION OF THE FACTS.

CAMP CUBA LIBRE, August 29, 1898.

TO THE SURGEONS OF VISITING BOARD:

GENTLEMEN: I wish to modify statements made to you yesterday morning as follows: There are 66 tubs used in company sinks instead of 60. Thirty-three are in use daily. Distance from sinks to mess tents is not greater than 50 yards. The lack of tubs and proximity of sinks to mess tents have been cited repeatedly in sanitary reports sent from this office. Herewith is submitted a rough diagram of camp and brief report of diseases affecting this regiment since its enlistment, with special reference to cases of typhoid fever. The diagnoses in many cases are incorrect, owing to the limited time cases were retained in quarters after presenting evidence of severe illness. We believe that the retention of fever cases in quarters was bad for the well and that the sick were much better off if sent to the hospital early. From April 26 to May 20 the regiment was quartered in the State fair grounds, $2\frac{1}{2}$ miles east of Des Moines, Iowa. During this period the health of the regiment was good. The nights were cold and there was considerable rain. Prevalent diseases in the order of frequency were: Coryza, bronchitis, tonsillitis, measles, and mumps. Regiment arrived in Jacksonville, May 26. From May 26 to June 28 there were scattering cases of measles and mumps; no malaria. There were 22 cases acute diarrhea, all of which were trivial, and recovery was prompt. There was 1 case of typhoid fever, which was our first case. He presented himself at morning sick call on three successive days; on the fourth he reported being unable to leave his quarters, and I called on him. At this time he had diarrhea, temperature $102\frac{1}{2}$, aching of limbs, pain in the lumbar region, furred tongue, somewhat drowsy, abdomen flat, pressure caused slight pain. About a week after he had been ill he presented characteristic rash of typhoid. Disease lasted eight weeks; man is now home on furlough. I called on him at 8 a. m. June 16 and sent him to the hospital about three hours afterwards. I tried to trace disease to some definite cause, but could find nothing of interest except that he had persisted in bathing in the river, notwithstanding orders had been issued prohibiting the same.

The second case of typhoid came to light on July 9. Case diagnosed July 9, p. m. Sent to hospital July 10, a. m.

Third case was private of Company H, tent F, east side. Diagnosis July 11; hospital July 12; died July 19. I was informed by Major Clarke of the division hospital that a post-mortem examination demonstrated this case to be true typhoid, there being ulcerated areas in the lower ileum, one of which had eroded vessels, and intestine contained blood.

The location of these cases is especially puzzling to me from the fact that the first is at the right of the camp, the second in about the middle, and the third is at the left. Each case represents a battalion. The men were not acquainted with each other; no two used the same sink.

During the month from June 28 to July 28 our sick book shows 6 cases of typhoid, scattered about the camp in an indiscriminate manner. These 6 plus the 1 appearing June 16 (which was the only case in June) make 7 cases up to July 28.

From July 28 to August 28 there are 45 cases diagnosed as typhoid. They are indicated on the chart.

In addition to these cases, in which we feel fairly sure of our diagnosis, there were 38 cases of continuous fever sent to the hospital which we were unable to diagnose, and marked them "awaiting diagnosis." Most of these cases are listed at hospital as typhoid. Fifteen instances of changed diagnosis are indicated on chart.

Regarding malaria, our books show the following: First case July 2, 2 cases July 5, 2 cases July 6, 4 cases July 7, 4 cases July 8, 1 case July 10, etc. Total cases in July, 23; total cases in August, 83.

Here, again, I am suspicious of our record. It is my opinion that some of these cases were mixed infection; at any rate, they were not true cases of malaria.

ABSTRACT OF A COMMUNICATION FROM THE COMMANDER OF COMPANY I, FIFTIETH IOWA VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. E. F. T. Cherry, commanding Company I, contributed a list of his men grouped in their tents, a plat of the regimental camp, and stated substantially as follows: The above-mentioned plat shows the grouping of the companies into battalions, from north to south, as follows: The north battalion, comprising Companies K, L, G, and I; the middle battalion, Companies M, D, C, and B; and the south battalion, Companies A, F, H, and E. The plat indicated battalion sinks 100 feet to the rear of the line of the company kitchens along the west flank of the regiment, and a line of bath houses along the northern flank.

Company I was at no time on detached service. The men of this company came chiefly from an urban population, and average intelligence was high; they were reasonably prudent as to personal conduct and habits affecting their health; their financial status was above the average.

Company I suffered less than any other company in the regiment with typhoid fever, with two exceptions, and less than any other company in the battalion to which it belonged, with one exception. The cause of this difference, in my opinion, was that the men of my company were more prudent as to personal conduct in regard to health. I also used extra precautions as to cleanliness of quarters, and exhausted all means at my command in endeavoring to protect the food of the men from flies, since the sinks and latrines were in such close proximity to the company kitchens.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

May.—(Camp McKinley, Des Moines, Iowa, and Jacksonville, Fla.) Mean strength averaged for fifteen days: Officers, 50; enlisted men, 749; total, 799. Admitted from command, 120; total to account for, 120. Of 99 completed cases 88 returned to duty; 11 were transferred to other hospitals. Remaining on sick report in quarters, 21.

Abstract of remarks by Charles S. Grant, first lieutenant and acting regimental surgeon:

Regiment organized at Camp McKinley, Des Moines, Iowa, May 18, 1898, and remained there from May 17 until May 21, 1898. Then ordered to Tampa, Fla., receiving orders while en route to Tampa, changing destination to Jacksonville, Fla., to join Seventh Army Corps.

It arrived in Jacksonville, Fla., May 25, and was assigned to Second Brigade, Second Division, Seventh Army Corps, stationed at Camp Cuba Libre, Jacksonville, Fla. Distance traveled, about 1,500 miles.

Health of regiment and sanitation are fair.

June.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 50; enlisted men, 897; total, 947. Remaining on sick report, 21; admitted from command, 79; total to account for, 100. Of 80 completed cases 49 returned to duty; 31 were transferred to other hospitals. Remaining on sick report in quarters, 20.

Abstract of remarks by J. M. Harriman, first lieutenant and acting regimental surgeon:

At Camp Cuba Libre during the month. One case of typhoid fever is the only serious case we have had during the month. He was transferred to the division hospital. The cause of the case is unknown to us. The prevailing diseases have not been of a serious nature. The sanitary condition of the camp has been fair during the month.

July.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 50; enlisted men, 1,190; total, 1,240. Remaining on sick report, 21; admitted from command, 138; by transfer, 13; total to account for, 172. Of 134 completed cases 98 returned to duty; 1 was discharged for disability; 35 transferred to other hospitals. Remaining on sick report in quarters, 38.

Abstract of remarks by First Lieutenant Harriman, acting regimental surgeon:

The prevailing diseases are typhoid fever and malarial fevers and gastro-intestinal troubles.

Slaked lime has been placed under all tent floors and in the sinks. Sinks are emptied as regularly as possible. The camp has been well drained.

One death. Quartermaster-sergeant died at Second Division Hospital July 19; cause, typhoid fever.

August.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 50; enlisted men, 1,181; total, 1,231. Remaining from last month, 35; admitted from command, 308; from other sources, 24; total to account for, 367. Of 285 completed cases 160 returned to duty; 1 was discharged; 24 were transferred to other hospitals. Remaining on sick report in quarters, 82.

Abstract of remarks by First Lieutenant Harriman, acting regimental surgeon:

The prevailing diseases are typhoid and malarial fevers and gastro-intestinal troubles.

The camp has been changed since last report. We are now on a higher and better piece of ground.

September.—(Camp Cuba Libre, Jacksonville, Fla., and Des Moines, Iowa.) Mean strength averaged for

seventeen days: Officers, 47; enlisted men, 1,236; total, 1,283. Remaining from last month, 77; admitted from command, 177; by transfer, 10; total to account for, 264. Of 264 completed cases 157 returned to duty; 3 died; 69 were transferred to other hospitals; 35 were otherwise disposed of.

Abstract of remarks by Surg. Charles S. Grant:

This command left Jacksonville, Fla., for Des Moines, Iowa, the 17th of September, 1898. A number of cases of typhoid fever developed on the train; two of which had to be left en route. The prevailing diseases were typhoid and malarial fevers. Believe that the typhoid was carried about by flies, as every precaution was taken to guard against it. The camp was kept clean, and the water was excellent. This command went on furlough for thirty days, September 21 to October 20, inclusive.

October.—(Camp McKinley, Des Moines, Iowa.) Mean strength averaged for thirty-one days: Officers, 1; enlisted men, 50; total, 51. (Guard detail, Fiftieth Iowa Volunteer Infantry left in camp.) Admitted from command, 6; total to account for, 6; transferred to other hospitals, 6.

Abstract of remarks by Surg. Charles S. Grant:

The prevailing disease is typhoid fever, cause unknown. The sanitation of the camp is good.

November.—Mean strength averaged for thirty days: Officers, 44; enlisted men, 1,039; total, 1,083. Admitted from command, 36; total to account for, 36. Of 36 completed cases 1 was discharged; 35 transferred to other hospitals.

Abstract of remarks by Surg. Charles S. Grant:

The regiment has been in camp at Camp McKinley during the month of November preparing to be mustered out. The regiment was mustered out on the 30th of November, 1898.

There was very little sickness during the month, most of it being diseases of the respiratory tracts.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FIFTIETH IOWA VOLUNTEER INFANTRY.

Brief outline of the medical history.—This regiment assembled at the State camp in the State fair grounds, about 2½ miles from the city of Des Moines, Iowa, on the 26th of April and remained encamped there until the 20th of May, upon which latter date it started by rail to join the Seventh Army Corps at Jacksonville, Fla. The regiment arrived at Camp Cuba Libre on the 25th of May, was assigned to the Second Brigade, Second Division of the Seventh Army Corps, and went into camp with the First Wisconsin and the Fourth Illinois—at that time the two other members of this brigade—in the suburb of Springfield, within the corporate limits of the city of Jacksonville. The regiment remained on its first camp site within the city limits until about the 1st of August, when, with the First Wisconsin (see history of the latter), it moved to new ground about a mile to the westward (see general sketch map of Seventh Army Corps at Jacksonville).

It is not known by the board if the Fiftieth Iowa again changed or shifted its camp while in Florida.

(N. B.—The Fourth Illinois was transferred to the Third Division of this corps August 13, and probably did not change its camp with the move of its brigade August 1, as above indicated. When the Ninth Illinois reached Jacksonville, August 8, and joined the Second Brigade of the Second Division it went into camp near and north of the new camp site of the Fiftieth Iowa. (Consult histories of these two regiments.)

It appears that the Fiftieth Iowa left Jacksonville, Fla., for Des Moines, Iowa, by rail on the 17th of September and arrived at the State camp on the 21st, whence it immediately went on furlough for thirty days previous to being mustered out. This furlough was extended to end of October. Having left a detachment of fifty men under one commissioned officer on guard at the State camp during the period of furlough, the regiment again assembled at Des Moines and spent the month of November in camp there. On the 30th of November, 1898, the Fiftieth Iowa was mustered out of the service of the United States at Des Moines, Iowa.

The medical history of this regiment thus covers a period of seven months and five days. Of this time the command first occupied for twenty-five days the camp provided by the State in the fair grounds near Des Moines. It next journeyed by rail during four days to Jacksonville, Fla. From May 25 to the 17th of September—that is, for one hundred and twenty days—this regiment was at Camp Cuba Libre, Jacksonville, Fla. It should be remembered that during the first seventy-two of these one hundred and twenty days the regimental camp site was not changed; that it adjoined and was to the leeward (north) of the First Wisconsin during the same time, and that in the new camp after the 1st of August for forty-eight days it occupied the same relative position. From September 17 to 21 the regiment was returning by rail from the national camp at Jacksonville, Fla., to the State camp at Des Moines, Iowa. After the latter date for forty-one days those men not in hospital or guarding the State camp were dispersed throughout the State of Iowa, not restrained by military discipline. From November 1 to 30 the regiment again occupied the State encampment under the discipline that reigned preparatory to muster out at the end of the month.

The following details of the sickness in this regiment show that it is highly probable that it did not carry to the national encampment at Jacksonville the infection of typhoid fever.

Development of typhoid fever and related sickness.—The following is a statement arranged in tabular form for easier and more rapid examination and classification of fevers (including typhoid) and intestinal disorders

which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the commencement of attacks were recorded as closely as they could be ascertained.

[Fiftieth Iowa Volunteer Infantry; mean strength, 1,097.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	
May.....	23	.....	.....	23	1	.....	.....	.....	.....
June.....	13	7	2	22	1	1	.....	.....	.....
July.....	29	5	10	44	14	11	.....	26	37
August.....	18	5	11	34	51	31	19	92	142
September.....	17	13	7	37	61	12	13	42	77
October.....	.....	.....	.....	.....	.....	.....	1	3	4
November.....	2	1	2	5	.....	2	.....	2	1
December.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	102	31	32	165	128	57	33	164	254

A rectification of the total number of so-called long malaria, as given in the above summary table by months, should be made by reducing the total of 57 to 56, thus requiring a corresponding reduction of the number of total probable typhoid attacks from 254 to 253.

The above tabulated deaths from disease by months were distributed among the companies of the regiment as follows:

	Company.											Band.	Total.
	B.	C.	D.	E.	F.	G.	H.	I.	L.	M.			
Typhoid.....	4	4	3	1	3	4	3	3	5	2	1	33	

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such attacks.

Combinations of typhoid fever in the Fiftieth Iowa.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.		
Certain typhoid (uncombined).....	14	20	8	9	8	5	16	19	7	15	21	9	153
Probable typhoid (uncombined).....	3	4	1	5	1	3	1	5	2	1	3	.....	29
Typhoid beginning in diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	2
Probable typhoid beginning in diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1
Typhoid preceded by diarrhea.....	.....	.....	.....	.....	.....	1	.....	1	1	2	.....	1	6
Probable typhoid preceded by diarrhea.....	.....	2	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	3
Typhoid preceded by malaria.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	2
Total certain typhoid ..	14	20	8	10	8	6	16	20	9	17	22	11	163
Total probable typhoid ..	3	6	1	5	1	3	2	5	2	2	3	.....	33
Total probable and certain typhoid ..	17	26	9	15	9	9	18	25	11	19	25	11	196

Combinations of continued or malarial fever in the Fiftieth Iowa.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.		
Short malaria (uncombined).....	11	9	9	6	12	9	18	6	11	8	11	6	116
Short malaria preceded by diarrhea.....	.....	.....	.....	.....	1	1	2	1	.....	.....	.....	.....	5
Short malaria and diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1
Two attacks short malaria.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1
Long malaria (uncombined).....	3	6	.....	3	2	4	6	2	6	5	4	7	48
Long malaria preceded by diarrhea.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	5
Long malaria followed by diarrhea.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Long and short malaria.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....	2
Total short malaria.....	11	9	10	7	12	10	20	8	13	8	11	9	128
Total long malaria.....	3	8	1	4	3	4	7	2	6	5	4	10	57

Totals include malaria in typhoid combinations.

Intestinal disorders in the Fiftieth Iowa.

	Company.											Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.		
Single short diarrhea.....	6	19	9	7	7	7	9	7	7	12	6	10	107
Two attacks short diarrhea.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	2
Short and long diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1
Short and prolonged diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1
Long diarrhea.....	3	.....	.....	.....	1	1	2	.....	1	.....	2	2	12
Prolonged diarrhea.....	1	.....	3	.....	1	2	1	.....	2	1	2	1	14
Total diarrhea.....	10	23	12	7	12	15	14	10	12	15	12	22	165

Totals include diarrhea in typhoid or malaria combinations.

The records of sickness in this regiment were found to be imperfect, incomplete, and to some extent conflicting. By way of illustration: There were 39 names of soldiers from the regiment appearing in the hospital records which do not appear in the regimental reports, and, vice versa, there are 21 names in the regimental records as having been sent to division hospital which are not to be found in the hospital reports. Furthermore, the medical records of this regiment reveal 30 cases of so-called short malaria, etc., whose final disposition is not recorded. How many of these incomplete cases were really typhoid fever and should have been added to the total given in the above summary table it was, of course, impossible for us to estimate. That there were at least some, possibly many, we think can not be reasonably questioned. Moreover, we have encountered 6 cases of undoubted typhoid fever (one of them fatal) which we have not tabulated for lack of proper initial date. Then, again, there were four men who are returned from the Adjutant-General's Office as having died of typhoid fever of whose sickness we have no other record. (These men died after the regiment returned to its State camp preparatory to being mustered out.) And, again, a man is certified to the Adjutant-General's Office as having died of typhoid fever on the 25th of September at Des Moines, Iowa, but the regimental sick report gives him as furloughed on the 24th of October. The above tabular statement should therefore be regarded as probably an underestimate of the prevalence of typhoid fever in the Fiftieth Iowa.

The salient points of the medical history (including

morbidity and mortality) of the Fiftieth Iowa Volunteer Infantry as a member of the Second Brigade and Second Division may be recapitulated in the following condensed form:

(a) The regiment was in the State camp near Des Moines, Iowa, from April 26 to May 20; it was in the national camp at Jacksonville, Fla., from May 25 to September 17, having changed camp site there August 1; it arrived at its State camp near Des Moines, Iowa, and went on furlough September 21 for thirty days, which was later extended to the end of October, preparatory to muster out—the regiment dispersing on the 21st of September, leaving 50 men on guard in the State camp; it again assembled at the State camp on November 1, 1898, remaining there until the 30th, when it was mustered out. The first probable attack of typhoid fever developed June 20, and the first certain attack of typhoid fever on June 16. There is, therefore, no evidence that this regiment carried with it to the national camp at Jacksonville, Fla., the infection of typhoid fever. The medical history by the board covers a period of seven months and five days (from April 26 to November 30, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 165; of so-called short malaria, etc., 128; of so-called long malaria, etc., 56; of probable typhoid fever, 33; of certain typhoid fever, 164. Total attacks of probable typhoid fever (long malaria, etc., included), 253.

(c) Total deaths from typhoid fever, 33; total deaths from all diseases, 33; mortality per cent of total probable typhoid attacks, 13.04; of total certain typhoid attacks, 20.12; per cent of typhoid deaths to all deaths by disease, 100.

(d) The mean strength was 1,097. The per cent of typhoid mortality to mean strength: As to total probable typhoid attacks was 23.06, while the average for the brigade was 22.43; as to total certain typhoid attacks was 14.95, while the average for the brigade was 14.26. The number of typhoid deaths per 1,000 of mean strength was 30.08, while the average for the brigade was 26.81, and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Fiftieth Iowa:

Disease.	Individuals.	Average age.
Short intestinal disorders	81	22.7
Long intestinal disorders	27	22.0
Prolonged intestinal disorders	28	23.0
Total intestinal disorders	136	22.6
Short malaria, etc.	107	22.2
Long malaria, etc.	57	23.1
Probable and certain typhoid attacks	187	23.1
Total probable and certain typhoid and long malaria ..	244	23.1
Grand total of all above classes	487	22.6
Twenty-seven soldiers who died from typhoid fever		23.9

For comparison of these average-age figures with similar data relative to other regiments of this brigade and division, we refer to the general table treating of this subject at the end of the Second Division of the Seventh Army Corps. (See also similar tables relating to certain regiments of the Second Army Corps at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS, AS EXHIBITED IN THE GRAPHIC CHART.

(a) In the first camp at Jacksonville it seems that the arrangement of the companies was, from north to south, as follows: K, L, G, and I in the north battalion; D, B, C, and M in the middle battalion; A, F, H, and E in the south battalion. This dissimilarity in the course of the company epidemics in the Fiftieth Iowa would appear to be incompatible with the assumption of a common, simultaneous, and more or less constantly acting agency as the chief means of propagation of these company epidemics.

(b) As in other regiments of the division, epidemics in the companies of the Fiftieth Iowa showed frequent greater or less exacerbations in their course, and the intervals between these exacerbations were more or less coincident with the average period of incubation of typhoid fever. (For a full discussion of this point, refer to the general remarks under the Second Division, Seventh Army Corps, as also under the Second Army Corps at Camp Meade.)

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) The testimony concerning the detached service of the companies of this regiment is as follows: Company A was detached from the regiment on provost-guard duty in the city of Jacksonville at corps headquarters from July 16 to 22. Reference to the graphic chart shows that there was 1 attack of typhoid fever in this company prior to this detached service—namely, on the 9th of July. The next attack recorded was on the 22d of July, the date the company rejoined its regiment. The next attack of typhoid fever recorded after that date was on August 10. On August 20 an epidemic of typhoid fever began in this company and continued until the departure of the regiment from Jacksonville for home on the 19th of September, preparatory to muster out. It is doubtful, in view of these facts, if this detached service exercised any decided influence upon the course of typhoid fever in this company, although it should be remarked that Company H of this same battalion (south battalion) began to suffer from typhoid fever on the 11th of July, and continued to experience an epidemic with some interruptions until the departure with the regiment from Jacksonville, after the middle of September. Companies F and E of the same battalion began to have a few scattering cases between the 14th and 23d of July. We may say on the whole, therefore, that if this detached service had any

influence at all, it was rather favorable than otherwise. Company B was on patrol duty in the woods east of the regimental camp, commencing August 22. The length of this detached service is not indicated, neither is it definitely known if the company camp during this time was separate from the regimental camp. Reference to the graphic chart shows that about the time of the patrol service the company was experiencing a very decided epidemic of typhoid fever. This epidemic suddenly ceased on the 3d of September, immediately after a rather sharp exacerbation. Because of the indefiniteness of the termination of this service it is impossible even to approximately estimate the influence of this special service upon the course of the epidemic in this company. Company D was detached from the regiment on provost-guard duty in the city of Jacksonville from August 19 to 27. Reference to the graphic chart shows that prior to this special service the company had already experienced some trouble from typhoid fever, and that two sharp outbreaks of the disease occurred during the continuance of this detached service; that a rather sharp outbreak of 5 cases occurred from the 30th of August to the 1st of September, inclusive. There were no attacks of typhoid fever recorded for this company subsequent to the latter date. It is reasonable to infer that this latter group of cases received its infection during the early period of that detached service, and we may believe that this last outbreak was due to the infection carried by the company rather than to special conditions surrounding the company camp in the city of Jacksonville. The fact that the rather sharp outbreak in this company suddenly ceased very soon after the end of this detached special service might seem to warrant the inference of a favorable influence due to the separation of the company from the regiment.

SPECIAL CHARACTERISTICS OF CERTAIN COMPANY EPIDEMICS AS EXHIBITED BY THE GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN TENTS, VIEWED FROM THE STAND-POINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) We have endeavored to ascertain the names of soldiers as they were grouped in their company tents during the period of the encampment at Jacksonville in order to examine into this important question. To this end we have requested such data from two different sources, namely, from the regimental surgeons and from the commanding officers of companies. The only information upon this point which we have received concerning this regiment was obtained from the commanding officer of Company I. The information thus obtained, when compared with the record of sickness, shows that the incidence of typhoid fever in this company was far more marked in certain tents than in others.

(b) A further indication of the existence and active influence of tent, squad, or comrade infection in this

command is the result of the following careful analysis we have made of the records of sickness in Company I of this regiment in connection with the grouping of the infected men in their respective tents, and the average time elapsing between successive or "connectable" attacks in the same tent and in adjoining tents. In this company, of 16 cases of typhoid fever platted in the tents occupied by the men, there were 8 attacks, or 50 per cent separated or "connectable" by intervals which could be fairly regarded as measuring the average period of incubation. (For fuller information concerning this matter, refer to the tables showing the number and per cent of connectable attacks in tents, as deduced from captains' tent lists for the Second Division, Seventh Army Corps. For comparison with similar data furnished by the Second Army Corps, we may refer to a similar table under that corps.)

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation in this disease from data obtained from two different sources, and we have found a striking coincidence in the general averages thus obtained (as will be seen by consulting general tables concerning this subject under the Second Division of the Seventh Army Corps):

(a) Period of incubation as deduced from the length of intervals between successive or "connectable" attacks of typhoid fever occurring in the same and in adjoining tents. The 16 platted attacks of typhoid fever occurring in tents of Company I of this regiment furnished four intervals which could be fairly regarded as measuring a period of incubation. The length of these four intervals averaged thirteen and two-tenths days.

(b) Period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid-fever attacks. The Fiftieth Iowa furnished only 1 example of such a combination, and the interval separating the beginning of the 2 attacks was eight days.

N. B.—For similar data concerning other regiments of the Second Division, Seventh Army Corps, see tables relative to this subject and similar tables of the Second Army Corps.

NINTH ILLINOIS VOLUNTEER INFANTRY.

Second Brigade, Second Division, Seventh Army Corps.

ABSTRACT OF TESTIMONY BEFORE BOARD.

[Maj. Andy Hall, surgeon.]

Springfield, Ill.—This regiment was enlisted in response to the second call for volunteers. The regiment went into camp at Springfield, Ill., on the 28th of June, and left there August 5 for Jacksonville, Fla., reaching the latter point on August 8. We had 2 cases of

typhoid fever while in camp at Springfield; 1 of them developed in a few days after going into camp and the other in a week's time thereafter, and both of them occurred in the same company, F, which latter, previous to the assembling of the regiment at Springfield, had been in camp at Benton, Ill., for about two weeks.

Jacksonville, Fla.—As above stated, the regiment arrived at Jacksonville, Fla., on August 8. It went into camp just north of the Fiftieth Iowa (second camp of latter), and was brigaded with the Fiftieth Iowa and First Wisconsin. Since coming here two or more cases have developed in the same company; could not say whether they were in the same tent together. There have been some cases developed since we came down here; 1 in Company E that I recall, and we have a few cases at the division hospital that were not diagnosed at the time we sent them there. Our sick report showed that we had 15 cases in the hospital this morning (August 30), most of them cases of simple intermittent fever with well-marked chills. Some of them have a history of a chill every other day. Some present the remittent type. Some of the cases above mentioned as in the hospital—4 or 5 of the 15—are there for orchitis or gonorrhea. We were not markedly troubled with intestinal disturbances at the State encampment, except during the first two or three days after establishing the camp at Springfield, Ill. Since arriving here there have been a few cases, not very marked, of diarrhea and dysentery.

In response to a question, Major Hall declared that he attributed the cause of typhoid fever in Company F above mentioned to probability of infection before they left Benton, Ill., the place where they encamped before coming to Springfield. One case developed in a few days after reaching the latter point, and the other four or five days later. He had attempted to investigate the origin of the typhoid cases which have occurred at Jacksonville, but he hardly knew how to account for them. In southern Illinois typhoid fever is something we have very extensively at times.

As to disposal of excrement, since coming to Jacksonville we have used tubs (half whisky or oil barrels with rope handles) that are removed twice a day, with a liberal use of lime. At first these tubs were only removed once a day, and we were not furnished with as many tubs as needed, but that trouble has been removed now. Lately they have removed these tubs twice a day, and supplied us with all we need.

The grounds we now occupy had not recently been occupied by another regiment, but there were evidences of the place having been used as a camp at some anterior date, but it may have been ten years ago. For example, bushes are growing over the old tin cans, water pipes, etc.

We found a water supply already established in the camp when we came here. Some men got at a spring

that was running out of the ground when we first arrived, and drank from it for a time before we learned of this practice. As soon as discovered we put a stop to it, and established a guard there for a while to watch the spring, but I can not say that the guard was there constantly. The men do not drink now of this water; at least I do not hear of it.

We have lost 2 men with typhoid since coming here—all the men we have lost (up to August 30) out of the regiment.

[Lieutenant-Colonel Swift, commanding the Ninth Illinois Volunteer Infantry.]

I believe the site of the present camp (Jacksonville, Fla.) was at some time formerly occupied by troops. There were old tin cans and other evidences of its being an old camp ground; in addition, there was an old pipe line for water supply, which we took up. The authorities of Jacksonville piped the water all over the country for the supply of the corps, and the pipe line runs to the company streets, with taps in it.

The latrines (battalion sinks) are on the north about 40 or 50 yards from the mess tents. They are commodious enough. The fault is they are cleaned twice a day and the authorities will not permit us to cover up the contents of the sinks with earth. The result is that half an hour after the "tubs" have been cleaned out they are as vile and filthy as ever, since the defecation of 1,300 or 1,400 men is an enormous amount, and the flies come there in great swarms. I was talking with a brigade surgeon this morning, and he told me that there was no necessity for that, since all we had to do was to cover individual defecation with lime; that they [the military authorities] would furnish an unlimited amount of lime. I have given orders to have this done. They furnished 16 barrels of lime in ten days, but it will take three times that amount. This system of defecation in tubs and leaving the stuff there for ten hours until it is removed constitutes an open privy. That is one thing. Here is my comment on Major Hall's report: "I would suggest that the two regiments that are near us that have such a large number of typhoid patients be removed and isolated, or our camp changed at once." My comment is as follows: "I heartily indorse that the regiment be removed from [the neighborhood of] fever-infected regiments. The disposal of kitchen refuse is unsatisfactory. They should have galvanized covered barrels, which can be obtained at small expense, and can be easily covered up. As it is, we have the half-barrels there, which are soaked and filthy, and when emptied they are offensive. If we had the galvanized covered barrels we could keep them clean and covered and keep the flies out. We ought to have two such for each company. These tubs are not sufficient, and they slop over when they load them in the wagon." These remarks apply to the kitchen refuse. They should

have the regular garbage carts. Colonel Swift makes further comment on this report that "the same remarks about kitchen refuse apply to the sinks (latrines)."

If they would cart this refuse out into the country and cover it up it would be far better. They will not allow us to put earth in the tubs because the scavengers are dumping their contents into the sewer.

We have good drainage here, and are just north of the Fiftieth Iowa, the First Wisconsin being next to them.

These two fever-infected regiments are both ordered to be mustered out, but we can not tell how soon. Major Hall here interjected the remark that the regiment had been encamped four weeks near these two fever-infected regiments.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE NINTH ILLINOIS VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. William E. Buck, commanding Company A, stated substantially as follows: The grouping of the companies in the battalions was: First Battalion, Companies A, B, C, and D; Second Battalion, Companies E, F, G, and H; Third Battalion, Companies I, K, L, and M.

This company was on detached service while at camp Cuba Libre, in the city of Jacksonville, on Bay street. The company was from a rural population, and the majority of the men were of an average financial status. "My company suffered very little from any disease, and less than any other company in the regiment. The men were extremely healthy, and I never lost a man while the company was in the service."

Capt. Orval P. Townsend, commanding Company B, furnished a list of his men distributed in tents and stated substantially as follows: The following is the arrangement of companies into battalions from right to left as it existed in the Ninth Illinois during our entire service: First Battalion, A, B, C, and D; Second Battalion, E, G, H, and F; Third Battalion, I, L, K, and M. This company was not on detached service at any time. It was drawn chiefly from a rural population, and the average intelligence was medium. The conduct of the men was very good, but habits affecting their health very poor. They did not seem to realize the necessity or importance of caution. In these respects, however, there was some improvement during the last few months of service. "I think my company suffered less from typhoid fever than did other companies, but I do not know the reason."

Capt. N. R. Bonner, commanding Company M, stated substantially as follows: My company was second from the left, the letters of my battalion being K, M, L, and I. This company had less typhoid fever than any company in the battalion. I account for this by special rules and orders issued by myself, which were enforced, namely, that the walls of every tent in the company be

rolled up, the tents swept clean, and beds put out to air by 7 o'clock each morning; that no drunkenness or excessive drinking be allowed at any time. I also issued orders that the corporal of each squad report to me in person at 9 o'clock each night those persons absent. I allowed no man to be absent from his own quarters after 9 p. m. I found that almost every case where men were in the habit of drinking and lying out at night they became the victims of typhoid fever or other diseases.

While at Jacksonville, Fla., my company was detailed on duty at the rifle range September 2, and it returned to the regiment September 13. While on duty there I permitted no man to be out at night. There was not a sick man in the company while on that service.

My company was chiefly from a rural population. The intelligence of the enlisted men was medium. They were reasonably prudent as to personal conduct and habits affecting their health. Their financial status was about the average. My company suffered less with typhoid fever than any other company in the battalion.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

July.—(Camp Tanner, Springfield, Ill.) Mean strength averaged for thirty-one days: Officers, 45; enlisted men, 1,276; total, 1,321. Admissions, 51; total to account for, 51. Of 41 completed cases, 40 returned to duty. Remaining on sick report in hospital, 11.

Abstract of remarks by Maj. Andy Hall, surgeon in charge:

With the exception of two men, the regiment was made up of volunteers and rendezvoused at Camp Tanner, Springfield, Ill., June 28, 1898.

The men suffered from the diseases incident to warm weather, change of diet, and water. We had only 2 cases of typhoid, but quite a number of intermittent fever, dysentery, and gastroenteritis.

Regiment left Camp Tanner for Jacksonville, Fla., August 5, 1898, with 48 officers and 1,277 men, arriving here (Jacksonville) the 8th of August, 1898.

August.—(Springfield, Ill., and Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 46; enlisted men, 1,276; total, 1,321. Remaining from last month, 11; admitted from command, 52; total to account for, 63. Of 47 completed cases, 45 returned to duty and 2 died. Remaining on sick report: In hospital, 13; in quarters, 3; total, 16.

Abstract of remarks by Maj. Andy Hall, surgeon:

The prevailing diseases are intermittent fevers, with a few cases of typhoid (fever) and dysentery. We also have a few cases of entero-colitis.

The intermittent fevers are due to hot weather, and camp was a swamp. The tents have all been floored and elevated 2 or 3 feet above the ground. Quinine is used freely.

As to the typhoid and dysentery, it is a hard matter to trace the source of infection. A few cases originated before leaving Springfield, Ill., August 5, and some have developed since our arrival here.

Methods for prevention: The camp is rigidly policed every

morning, and no one is allowed to throw any waste on the ground during the day. Sentinels are kept at the water-closets to see that they are kept clean and shovel lime in the tubs every few hours or when necessary, and the food is carefully inspected. All suspicious cases are sent to the division hospital early.

The 2 cases of typhoid that have terminated fatally have died in Second Division Hospital, and no autopsy was made in either case.

September.—(Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 46; enlisted men, 1,244; total, 1,290. Admitted from command, 495; total to account for, 495. Of 434 completed cases, 314 returned to duty; 100 transferred to other hospitals; otherwise disposed of, 20. Remaining on sick report in quarters, 61.

The report is signed by First Lieut. R. Washburn, assistant surgeon, who makes no remarks.

October.—(Jacksonville, Fla., and Savannah, Ga.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,227; total, 1,273. Remaining from last month, 61; admitted from command, 337; total to account for, 398. Of 367 completed cases, 276 were returned to duty; 86 transferred; 5 otherwise disposed of. Remaining on sick report in quarters, 31.

Abstract of remarks by Maj. Andy Hall, surgeon:

This regiment was encamped at Camp Cuba Libre, Jacksonville, Fla., from the 1st to the 21st of October; was en route to Savannah, Ga., from the 21st to the 22d, since which time it has been encamped near Savannah, Ga.

November.—(Camp Onward, Savannah, Ga.) Mean strength averaged for thirty days: Officers, 45; enlisted men, 1,223; total, 1,268. Remaining from last month, 31; admitted from command, 352; total to account for, 383. Of 345 completed cases, 325 returned to duty; 2 died; transferred, 18. Remaining on sick report in quarters, 38.

Abstract of remarks by Andy Hall, major and surgeon:

This command has been in Camp Onward, near Savannah, Ga., from November 1 to 30, 1898.

December.—(Camp Onward, Savannah, Ga.) Mean strength averaged for thirty-one days: Officers, 45; enlisted men, 1,204; total, 1,249. Remaining from last month, 39; admitted from command, 272; total to account for, 311. Of 300 completed cases, 249 were returned to duty; 1 died; transferred, 50. Remaining on sick report, none stated.

Abstract of remarks by Maj. Andy Hall, surgeon:

The Ninth Regiment Illinois Volunteers has been in camp near Savannah, Ga., during the month of December, arriving here October 22, 1898.

During the first month several cases of cerebro-spinal meningitis developed. It was during a cold, rainy week and before the men were supplied with stoves. They were immediately isolated, clothing and bedding disinfected, and one Sibley stove put in each three tents. No two cases occurred in one tent, and no cases appeared after the tents were supplied with stoves.

Several cases of measles have occurred during the month, all of which have been immediately isolated and clothing disinfected.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE NINTH ILLINOIS VOLUNTEER INFANTRY.

Brief outline of the medical history.—In response to the second call for volunteers, this regiment assembled at the State encampment, Springfield, Ill., on the 28th of June, several weeks after the Illinois regiments of the first call had departed from Camp Tanner and joined the respective corps to which they had been assigned in the various national encampments. It remained in the State camp until the 5th of August, on which date it proceeded by rail to the city of Jacksonville, Fla., arriving there on the 8th, having been en route three days.

Upon arrival at Camp Cuba Libre, this regiment was assigned to the Second Brigade, Second Division of the Seventh Army Corps, and went into camp near the Fiftieth Iowa and First Wisconsin, the two other members of the brigade, upon a site located near and north of the new camp of the Fiftieth Iowa. (See general sketch map of Seventh Corps at Jacksonville.) It should be stated here that from the 29th of May until the 13th of August the Fourth Illinois had been brigaded with the Fiftieth Iowa and First Wisconsin, but on the latter date was transferred to the Third Division. (See history of Fourth Illinois in Third Division.) Up to the date of inspection of the Ninth Illinois by the board (about September 1 and four weeks after arrival) the site of its camp had not been changed. Furthermore, it is not known by us if the regiment moved from this camp site before its departure from Camp Cuba Libre for Camp Onward.

On the 21st of October the Ninth Illinois left Jacksonville, Fla., and went by rail to Camp Onward, near Savannah, Ga., arriving there on the 22d. It was still in this camp on the 31st of December, 1898, when its medical history, as discussed by the board, ended, although the regiment was not mustered out of the service of the United States until May 26, 1899, at which time it was at Augusta, Ga.

The medical history as furnished by the board covers six months and two days. Thirty-eight days of this time, including the whole of July, were spent by the regiment at its State encampment near Springfield, Ill. Three or four days were next occupied traveling by rail (from August 5 to 8) between Springfield, Ill., and Jacksonville, Fla., during very hot weather. Seventy-four days were then spent in Camp Cuba Libre, Jacksonville, Fla., during the last four weeks in August, all of September, and the first three weeks in October.

The following detailed account of sickness in this regiment, as in the other regiments of this division, shows that nearly all of the serious illness occurred while in camp at Jacksonville, Fla. It is, however, noteworthy that according to the testimony of the surgeon in charge typhoid fever obtained a very early introduction into this command, the infection having

been brought to the State encampment with Company F, which had passed the previous two weeks at Benton, Ill., where it probably acquired the seeds of the disease. Furthermore, of the six Illinois regiments which had preceded this one at their State camp, only two had escaped infection there, the Fourth Illinois being one. (See also history of the Second Illinois.) As stated above, the Fourth Illinois was originally brigaded with the Fiftieth Iowa and First Wisconsin until the Ninth Illinois took its place in the Second Brigade, vacated by the transfer of the Fourth Illinois to the Third Division. It is of interest in this connection to remark that typhoid had been slowly developing and spreading in the Fourth Illinois during the month prior to its transfer to the Third Division.

Reference to the subjoined detailed movement of sickness in the Ninth Illinois will prove that this regiment certainly arrived in the national encampment at Jacksonville already infected with typhoid fever.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the true prevalence of typhoid fever. In all cases the dates of the commencement of attacks were recorded as closely as they could be ascertained:

[Ninth Illinois Volunteer Infantry; mean strength, 1,288.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	All other.
July.....	9	4	1	14	14	1	.....	4	5	.....
August.....	6	1	.....	7	14	3	1	18	21	2
September.....	90	32	9	131	50	15	11	75	101	4
October.....	62	2	2	66	64	9	24	49	82	8
November.....	61	8	2	71	45	11	6	5	22	1
December.....	12	2	.....	14	48	9	5	2	16	2
Total.....	240	49	14	303	235	48	47	153	248	10

^aIncluding 1 typhoid death in January, 1899.

The above tabulated deaths from disease by months were distributed among the companies of the regiment as follows:

	Company.												Band.	Total.
	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Typhoid	1	2	1	2	3	1	3	.....	2	1	1	1	18
Other diseases.....	2	.....	1	.....	2	.....	1	2	.....	2	.....	.....	10
Total	3	2	2	2	5	1	4	2	2	3	1	1	28	

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malarial, etc., and of intestinal disorders in individuals; (a) who have had no other recorded attacks

(of the categories we have been considering), and (b) who have had such other attacks:

Combinations of typhoid fever in the Ninth Illinois.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	12	11	9	8	11	14	12	10	4	6	13	12	3	125
Probable typhoid (uncombined).....	4	3	1	2	3	4	4	3	3	.....	6	2	1	36
Typhoid beginning in diarrhea.....	.....	1	.....	1	.....	1	.....	2	2	.....	.....	.....	.....	7
Typhoid preceded by diarrhea.....	.....	.....	.....	.....	1	1	.....	1	.....	3	.....	.....	.....	6
Probable typhoid preceded by diarrhea.....	3	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	5
Typhoid followed by diarrhea.....	1	.....	.....	.....	2	.....	.....	.....	.....	1	.....	.....	.....	5
Probable typhoid followed by diarrhea.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Typhoid preceded by malaria.....	1	.....	2	.....	1	.....	1	1	.....	1	1	.....	.....	8
Probable typhoid preceded by malaria.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
Probable typhoid followed by malaria.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Combinations of three diseases.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Total certain typhoid.....	14	12	10	10	15	17	13	12	7	12	14	14	3	153
Total probable typhoid.....	8	6	2	2	3	6	4	3	4	.....	6	2	1	47
Total certain and probable typhoid.....	22	18	12	12	18	23	17	15	11	12	20	16	4	200

Combinations of continued or malarial fever in the Ninth Illinois.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	8	12	12	10	11	13	8	18	14	15	13	14	.....	148
Short malaria preceded by diarrhea.....	.....	2	1	3	4	1	.....	4	1	7	3	2	.....	28
Short malaria followed by diarrhea.....	3	1	2	1	.....	1	.....	2	1	.....	.....	1	.....	12
Short malaria preceded and followed by diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Two attacks short malaria.....	1	.....	1	.....	4	2	2	2	1	.....	4	.....	.....	15
Short and long malaria.....	.....	1	.....	1	1	.....	1	1	.....	.....	.....	.....	.....	4
Long malaria (uncombined).....	2	2	3	2	2	5	2	2	3	6	5	3	1	38
Long malaria preceded by diarrhea.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	.....	.....	2
Long malaria followed by diarrhea.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	2
Long and short malaria.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1
Total short malaria.....	15	18	16	17	16	23	12	30	21	22	18	27	.....	235
Total long malaria.....	2	2	4	3	3	6	2	4	5	6	6	4	1	48

Totals include malaria in typhoid combinations.

Intestinal disorders in the Ninth Illinois.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea.....	14	18	9	19	10	8	12	8	13	16	15	12	2	156
Two attacks short diarrhea.....	2	.....	2	1	3	1	.....	3	2	1	1	.....	.....	15
Long diarrhea.....	3	3	.....	2	2	.....	3	2	1	3	.....	2	.....	21
Two attacks long diarrhea.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	1	.....	.....	3
Prolonged diarrhea.....	1	5	.....	3	2	.....	1	.....	1	3	.....	.....	.....	16
Long, prolonged, two short, and a prolonged diarrhea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1
Total diarrhea.....	28	27	22	31	28	19	15	19	25	35	28	22	2	301

Totals include diarrhea in malaria and typhoid combinations.

The records of sickness in this regiment were found to be imperfect, incomplete, and to some extent conflicting. By way of illustration: There were 70 names of soldiers from this regiment in the hospital records which were not found in the regimental sick reports, and, vice versa, there were 36 men named in the regi-

mental records as having been sent to the division hospital who were not found in the hospital records. Furthermore, the records show 38 cases of so-called short malaria, etc., whose final disposition is not indicated. How many of these incomplete cases were really typhoid fever and should have been added to the total given in the above summary table it was, of course, impossible for us to estimate. That there were at least some, possibly many, we think can not be reasonably questioned. Moreover, at least 1 certain case of typhoid fever (terminating fatally) has not been tabulated for lack of proper initial date, and we have encountered 3 fatal cases returned to the Adjutant-General's Office as having died of typhoid fever of which we have found no other record. The above tabular statement should, in view of all this, be regarded as expressing a very conservative estimate of the prevalence of typhoid fever in the Ninth Illinois.

The salient points of the medical history (including morbidity and mortality) of the Ninth Illinois Volunteer Infantry as a member of the Second Brigade and Second Division may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Springfield, Ill., from June 28 to August 5. It was in the national camp at Jacksonville, Fla., from August 8 to October 21. It was in Camp Onward, near Savannah, Ga., from October 22 to December 31, 1898. It was mustered out on the 26th of May, 1899, at Augusta, Ga. The initial date of the first probable attack of typhoid fever was as early as July 6. It is beyond doubt that this regiment arrived in the national camp at Jacksonville, Fla., already infected with typhoid fever. The medical history by the board covers a period of six months and two days (from June 28 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorders, 303; of so-called short malaria, etc., 235; of so-called long malaria, etc., 48; of probable typhoid fever, 47, and of certain typhoid fever, 153. Total attacks of probable typhoid fever (long malaria, etc., included), 248.

(c) Total deaths from typhoid fever, 18; total deaths from all diseases, 28; mortality per cent of total probable typhoid attacks, 7.25; of certain total typhoid attacks, 11.76; per cent of typhoid deaths to all deaths by disease, 64.28.

(d) The mean strength was 1,288. The per cent of typhoid morbidity to mean strength: As to total probable typhoid attacks was 19.25, while the average for the brigade was 22.44; as to total certain typhoid attacks was 11.87, while the average for the brigade was 14.26. The number of typhoid deaths per 1,000 of mean strength was 13.97, while the average for the brigade was 26.81 and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers grouped by the diseases we have

been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Ninth Illinois:

Disease.	Individuals.	Average age.
Short intestinal disorders.....	142	24.9
Long intestinal disorders.....	25	26.2
Prolonged intestinal disorders.....	10	29.5
Total intestinal disorders.....	177	25.3
Short malaria, etc.....	150	24.7
Long malaria, etc.....	33	24.6
Probable and certain typhoid attacks.....	173	23.8
Total probable and certain typhoid and long malaria.....	206	24.0
Grand total of all above classes.....	533	24.6
Fourteen soldiers who died from typhoid fever.....		22.4

For comparison of these average-age figures with similar data relative to other regiments of this brigade and division we refer to the general tables treating of this subject at the end of the Second Division of the Seventh Army Corps. (See also similar tables relative to certain regiments of the Second Army Corps at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) It seems that the arrangement of the companies in the camp at Jacksonville was, from right to left, as follows: First Battalion, A, B, C, and D; Second Battalion, E, G, H, and F; Third Battalion, I, L, K, and M. This dissimilarity in the course of the company epidemics in the Ninth Illinois, as in the other regiments of this division, would appear to be incompatible with the assumption of a common, simultaneous, and more or less constantly acting agency as the chief means of propagation of these company epidemics.

(b) As in other regiments of the division, epidemics in the companies of the Ninth Illinois showed frequent greater or less exacerbations in their course, and the intervals between these exacerbations were more or less coincident with the average period of incubation of typhoid fever. (For a full discussion of this point refer to the general remarks under the Second Division, Seventh Army Corps; as also under the Second Army Corps at Camp Meade.)

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) See the remarks of the surgeon of the regiment concerning an outbreak of typhoid fever in Company B previous to the assembling of the regiment at its State camp.

(b) The testimony concerning the detached service of the companies of this regiment is as follows: Company A was detached from the regiment on provost-guard duty in the city of Jacksonville from August 25 to September 4. Note that this period of special service

corresponds with the commencement of an epidemic of typhoid fever in this company, as is shown by reference to the graphic chart. The epidemic seems to have been limited to small groups of attacks of typhoid fever, separated by intervals of ten days or more. This is somewhat similar to the history of other companies of the regiment which were not on detached service at any time during the encampment of the regiment at Jacksonville, and we can not therefore attribute any special influence to this detached service upon the course of the epidemic. Company M was detached from the regiment upon special service at the rifle range from September 2 to 13, inclusive. The commanding officer of the company remarks concerning this detached service as follows: "While on duty there I permitted no man to be out at night. There was not a sick man in the company while on that service." Reference to the graphic chart shows that prior to the commencement of this detached service Company M experienced one attack of typhoid fever on the 13th of August and another attack on the 20th of August. From the latter date up to the 12th of September there was no recorded serious illness in the company. On the 12th, the date before the return of the company to its regimental camp, an attack of typhoid fever occurred, and this attack was followed by a series of attacks, with some interruptions, up to the 23d of October, inclusive. It would therefore seem that although this company, according to the statement of the captain commanding, and also according to the graphic chart and the foregoing tabular statement, the company may have been free from sickness during the time of this detached service, the return to the camp was coincident with the commencement of a rather serious epidemic of typhoid fever in this command. We must, therefore, assume that the infection probably took place during the time of the encampment of the company at the rifle range.

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation in this disease from data obtained from two different sources; and we have found a striking coincidence in the general averages thus obtained.

(a) We have, however, been unable to obtain the necessary data from the Ninth Illinois only from one of these sources—the period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid fever attacks. The Ninth Illinois furnishes three combinations of diarrhea preceding typhoid fever separated by intervals which could be fairly regarded as measuring the average period of incubation. The average length of the intervals in these three cases was ten days.

N. B.—For similar data concerning other regiments of this division, see tables of the Second Division,

Seventh Army Corps, relative to this subject, and also similar tables for the Second Army Corps at Camp Meade.

FIRST WISCONSIN VOLUNTEER INFANTRY.

Second Brigade, Second Division, Seventh Army Corps.

ABSTRACT OF TESTIMONY BEFORE THE BOARD.

(Capt. Joseph B. Whiting, jr., assistant surgeon in charge, the surgeon, Major Evans, having gone home.)

Camp Harvey, near Milwaukee, Wis.—The regiment assembled April 28 at Camp Harvey, near Milwaukee, Wis., and remained there until May 21. The regiment was mustered into the service of the United States on May 14. There was no typhoid fever while in Camp Harvey, and not much sickness of any kind there. There was some pneumonia, and there were a couple of cases of appendicitis. There was some diarrhea, but no dysentery.

Jacksonville, Fla.—The regiment left Camp Harvey May 21 and arrived at Jacksonville May 24, having been diverted here by telegraphic orders while en route to Tampa, Fla. The regiment went into camp (east of the present site) between the First North Carolina on the south and the Fiftieth Iowa on the north; the Fourth Virginia being to the westward of the northern half of that flank of our regiment. "I was detached from my regiment three or four days after I reached here, and assigned to the (division) hospital. After we got here some recruiting officers were sent home, and they recruited the regiment from eighty odd to one hundred to the company. I can not give you the date when these recruits arrived. I have not been with my regiment, having remained with them less than a week after our arrival here, and having been back with them only three days since my return, when I took the major-surgeon's place, who was on leave. These recruits came at different times in batches and at irregular intervals." Captain Parsons stated that one of the recruits has had typhoid fever. Lieutenant Heidersheide volunteered the information that "our bunch of recruits came about the 1st of July. Their health has been very good until recently; several of them now (August 28) have climatic fevers, but none of them have typhoid fever to my knowledge, and I go to see them quite often." Resumption of Captain Whiting's testimony: Our water supply, from the city of Jacksonville, was installed immediately after our arrival, and we used no other water from the first.

The disposal of waste, feces, etc., was as follows: The evacuations were made in half whisky barrels located in battalion latrines. This matter was removed by the authorized laborers in the employ of the health authorities of the city of Jacksonville. For the convenience of the men in the latrines there was simply a pole, supported along the edge of the row of tubs, that the men sat upon. There was no arrangement by which

at night the men could be guided in the use of the latrines, so that they might place themselves directly over the tub; and it was possible enough, especially in the use of the latrines at night, for the excreta to fall upon the ground between the tubs. These half whisky barrels had rope handles to them. At first they were changed twice a day, afterwards they used to go two or three days unchanged, and that not very rarely. "I have seen these tubs full to overflowing a great many times." Captain Whiting thought that five tubs would be the outside number used at any one time in the battalion sink. There were battalion sinks both in the old and in the new camp sites, and this tub system was employed in both. In lifting the tubs into the scavenger wagons and hauling them away there was a great deal of slopping over of the contents. This slopping over was not only between the sinks and the wagons, but also along the road which the latter traversed; that is, from the sinks to the highway and along the highway at least as far as the limits of the camp. There was no attempt at disinfection of these tubs, except the use of crude or unslaked lime. This would not be put into the tubs until they were returned by the scavenger empty. It would then also be sprinkled upon the ground of the latrine. "At the division hospital we used some sulphate of iron for a while, and I think they have returned to crude carbolic acid. I do not know whether this was by general order." When these tubs got back from the dumping point they were sprinkled with lime, but they were not clean, and they smelled badly. Captain Whiting did not think the smell came any more from the tub than from the inclosure in which it was placed (the latrine)—the whole latrine was ill-smelling. When questioned as to whether he had seen any toilet paper which had been blowing around the grounds, Captain Whiting replied that he had not. "I was not on duty with the regiment, and the only knowledge I had of these circumstances was obtained while I was staying with the mess and used their water-closet. Occasionally I used to go around on an inspecting tour."

There was a "shell road" running east and west through the encampment of the regiment. Company C was parallel to and along the north side of the road; while Company H was upon its south side. The companies next to H on the south were E, D, A, I, L, M, and K. Next to C on the north were Companies F, B, and G. The company streets ran parallel to this shell road, and the battalion latrines were located on the west flank of the regiment. After considerable questioning as to the course pursued by the scavenger wagons, and more or less indefinite and confusing answering, a member of the board stated the résumé of the testimony upon this point as follows: "The testimony is that these wagons carrying the load from the latrines of this regiment did not return along that shell road between the two companies where the outbreak occurred, but that loaded wagons from the Forty-ninth

and Fiftieth Iowa Regiments, from the Second Division Hospital, and from the officers' sinks of the First Wisconsin did pass along this shell road between the two companies named, and that the feces slopped over along this road. The point is to find out whether infection took place in those regiments earlier than the outbreak in these two companies." The latrines were located from 125 to 150 feet to the rear of the mess tents. The scavenger wagons came from the shell road, turned toward the line of battalion sinks, and, having been filled, turned and went out again the same way. When these wagons came to the latrines of the First Wisconsin they were already partly filled from the latrines of other commands.

No typhoid fever developed en route between Camp Harvey and Jacksonville; there was no serious illness at all during the journey. One man was put off from the first section of the train and left in the hospital; could not say whether he had typhoid fever. Asked when first case of typhoid appeared after reaching Jacksonville, Captain Whiting explained that he was detached from his regiment within three or four days after reaching here, and could not definitely state. Thereupon a member of the board remarked that "The first case of typhoid fever in your register was admitted to sick report on July 5—sergeant, Company F—and was sent to the Second Division Hospital. Was it true that this regiment came here with typhoid fever, as we heard?" To this Captain Whiting replied, "No, sir." From the register of the regiment, one of the board again remarked that, "Beginning with the 2d of June, this regiment seems to have been very much affected by 'intermittent fever'—'malarial fever of the intermittent type.' It seems to be the chief cause of sickness for the month of June, and, I may say, to a very large extent." Hereupon the division surgeon, Major Evans, who was present, remarked, "There have been typhoids (at the division hospital) that were not diagnosed." Continuing, a member of the board stated, "The register shows the second case on the 2d of July, private, Company C; and another private, Company C, on July 8; and again a private of Company C on the same date; and still another private of Company C on July 9. Then follow a number of cases of 'malarial fever, remittent,' sent to the division hospital. I think it would be interesting if we ascertained at the hospital if any cases admitted prior to July 5 developed typhoid. The next cases in the register are: July 15, a case in Company C; July 17, another case in Company C; July 19, a corporal in Company B; July 21, a private in Company H, and on the same date two privates in Company C; on the 23d of July, two privates in Company H and another private in Company C; on the 27th, a private in Company F; on the 28th, a private in Company A, and one also in Company F; on the 30th, a private in Company L. The books are not kept up beyond this date." It was here remarked by Lieutenant

Heidersheide, second assistant surgeon, First Wisconsin. "There were a number of cases we did not hold to diagnose. I came here on the 27th of July." Captain Whiting continued: "The first case of typhoid fever was in Company F, the second row of tents north of the shell road." Captain Parsons, commander of Company C, being present, confirmed this statement, as also that Company F was immediately north of his company. (Note by the board: In a plot of this regiment furnished by Lieut. and Asst. Surg. J. S. Wilson, U. S. Army, Company E is plotted as located between Companies C and F of this battalion.) Captain Parsons, questioned as to whether the typhoid fever in this company was mainly limited to certain tents, replied that, while every tent did not have fever, the cases were not particularly limited to certain tents. In this connection Captain Parsons stated, "We came here with 10 by 12 (feet) tents, 9 men in each, and we had not disposed of those tents before we had the typhoid fever. I believe the typhoid fever occurred in these large tents."

[Maj. J. R. McDill, brigade surgeon, unassigned, and Major Kean, commandant of the Second Division Hospital.]

Camp Harvey, near Milwaukee, Wis.—Major McDill was originally associated with the First Wisconsin at the beginning of their history. The regiment rendezvoused at Milwaukee, and were there for about three weeks, from the 5th to the 25th of May. During the State encampment at Camp Harvey there was no typhoid fever. When the regiment left Camp Harvey it was ordered to proceed to Tampa, Fla. While en route one man was left behind at Nashville. This proved to be a case of pneumonia. It was not typhoid. The man joined the regiment again in ten days or two weeks.

Jacksonville, Fla.—The regiment reached Jacksonville, Fla., having been diverted en route, about May 28, and it went into camp just west of the railroad, and two battalions were divided from the third by a "shell road." Major McDill could not give definitely the letters of the companies of the above-mentioned battalions, for this was a new regiment to him, he having been detached to another regiment. Company H was on the south side of the road and Company C on the north side. The line of sinks was on the west flank of the regiment. The officers' sink was near the railroad, on the east. Having left the regiment on the 5th of June, Major McDill could not state anything very definite about the earliest appearance of typhoid fever in the regiment. When the men began to come down with it they came very fast, evidently having been lying about in quarters for some time. Major Kean, commandant of the Second Division Hospital, being present with the records of the hospital, furnished full information, at the request of a member of the board, concerning the early appearance of men in this hospital with typhoid fever coming from the First Wisconsin: A private was

admitted June 1, age 23, and remained until June 22, with the diagnosis of "remittent malarial fever." Major McDill remarked: "He had typhoid fever; I recollect it. I detained him a week in the regimental hospital, and they kept him a week after he was transferred. I believe it was typhoid fever." Major Kean continued: He was discharged June 22 from the service on a certificate of disability. The assistant surgeon in charge of the ward in the Second Division Hospital, where this man was under treatment, here stated: "I have diagnosed this case as typhoid fever on my ward record." Major Kean continued: The next was admitted on June 7 as "malarial fever, remittent," and there were also a number of diarrheas from that regiment. On June 11 there was another man admitted with "malarial fever, remittent," he was discharged on the 14th. A member of the board remarked: "Certainly he did not have typhoid fever." Major Kean resumed: Between the 14th and 20th there was another case of "remittent," evidently not typhoid. On the 29th of June was a case of two weeks' duration, a lieutenant of Company C, who was discharged the 13th of July; diagnosis, "malarial fever, continued." On July 3 a private of Company C, age 31, was admitted, and on August 13 he was sent to Pablo Beach, diagnosis "typhoid fever." There was a case in the hospital from July 4 to 24 with "intermittent malaria," a private of Company C having been in the hospital twenty days, but at the end of this time he was not ready for duty, but was sent to quarters. July 6 a private of Company C was admitted, and on August 3 he died. On July 7 a man of Company F was admitted and died July 15. And then here is another man from Company K, diagnosis "continued malarial fever," returned to quarters eighteen days after admission not fit for duty. Then comes a musician admitted on the 7th of July, diagnosed "typhoid;" upon the regimental register is "malarial fever remittent." The next man was "malarial fever," of the same date, and there were several patients admitted into the hospital on the same date. One of them is still in the hospital to-day (August 28). On July 8 a man was admitted, and died July 14 of peritonitis from perforation; diagnosed "typhoid fever." The next admission is on July 9 from Company C, "typhoid fever;" and also another from Company C, who left the hospital August 23. The latter was entered on the regimental register as "malarial fever, tertian." "He had repeated hemorrhages, purpura, and bad bed-sores; was discharged August 23 hardly able to walk." And then next, admitted July 10 from Company C, a man who died July 17. Admitted July 11 from Company C, "malarial fever, remittent," a man who went to quarters August 2. Admitted July 11 a private of Company C, "typhoid fever; discharged August 16. This man was diagnosed on the regimental register as "malarial fever, remittent." The next case is one of "malarial fever, remittent;" in the hospital only a few

days. Admitted 13th from Company C a case of "remittent malarial fever;" discharged to quarters on the 26th. Admitted July 13 a case of "typhoid fever;" sent to Pablo Beach August 19 convalescent. This man was diagnosed in the regimental register as "malarial fever, remittent." A case admitted from Company C July 14, who remained until August 19, diagnosis "typhoid fever." This man also recorded in the regimental register as "continued malaria." From July 15 to 24 is a ten-day case of "malarial fever," and from the 14th to the 25th is a case of "malarial fever, continued." On the 15th of July a man was admitted to the hospital with "typhoid fever" from Company C, and returned to quarters August 2, but this man was not entered at all upon the regimental sick report. July 16 to August 2 a man was in hospital from Company C, diagnosed both on the regimental and hospital registers as "typhoid fever." On July 17 a man was admitted from Company C, and went to duty August 6—"typhoid fever." There was admitted July 18 from Company E a case of typhoid fever, diagnosed on the regimental register as "malarial fever, remittent." He remained in the hospital until the 26th of August. July 18 a man was admitted from Company L, and went to duty August 13. July 18 to August 15 a man is recorded as present in the division hospital who is not on the regimental register—a private of Company C. On July 19 a man is admitted with "typhoid fever," and August 19 is sent to Pablo Beach. On the regimental register this man was recorded as a case of "malarial fever, intermittent."

The officers were not at first treated in this hospital, but on July 17 a staff officer was admitted as "malarial fever, remittent;" he was furloughed. From Company K a man was admitted July 19 and did not go to duty until August 16; called "malarial fever." Here is another case, marked "remittent malarial fever," that ran from the 19th to the 31st, from Company C; is also marked in the regimental register as "malarial fever." A corporal of Company B was admitted July 19 who is entered on the regimental register as "typhoid fever;" returned to regiment August 8. On July 20 a private of Company B was admitted as "malarial fever, remittent," and remained in hospital until August 6, and then went to Pablo Beach. From Company C a man was admitted July 21 with "typhoid fever;" sent to Pablo Beach August 16; this man was recorded on the regimental register as "malarial fever, remittent." On the same date a man was admitted from Company C as "typhoid fever" who was discharged August 23.

[Lieut. George M. Heidersheide, second assistant surgeon.]

Jacksonville, Fla.—Lieutenant Heidersheide does not know anything about the history of the regiment until he came here on the 27th of July. The regiment was then at its old camp, and three days later moved to the

present site. Asked his opinion about the tub system for the disposal of feces, he replied: "I do not like it as well as I do the flushing (water carriage) system." As to the pit system, he had not had enough experience with it to make a comparison.

Company F has been on patrol duty in the city of Jacksonville. They came back a week ago, but they had not been back long enough to learn the comparative effects of patrol duty and camp life.

There were many cases of continued fevers in quarters when he arrived in camp, but he could not tell how many. It was necessary for one to hunt them out, for the men foolishly got set against the division hospital, although it was explained to them why they should go there early. "I was not in camp long before I detected typhoid, and I recognized the fact that it was best to get them out of quarters as soon as possible. So one day I made a clean job of it. I started into the farthest tent down the line, taking temperatures and memoranda of the fever conditions. They were sent off as soon as possible. At length we found that there was so much trouble in the development of fevers that we were obliged to go through this performance every day. Furthermore, we established sick quarters; having no right to a hospital, we had a few tents put up there, and any person ailing considerably was put into these quarters and watched for a day or so before he would be sent off to the hospital. We found that we could manage the trouble best in this way. I calculate that this was about a week after I came. Our major-surgeon was worked to death. I remember one morning on my side I had 76 people on sick call, and I presume the regimental surgeon had as many more—all these in addition to those who had to be seen in the tents." For a while continued fever was on the increase in the regiment; latterly it has been decreasing; but we have now in division hospital more than we have had before. "This is largely due to the fact that we sent such a number over to the hospital, as above stated." We have now hardly any sick in quarters, as before stated. When their fevers run up to 101° we send them over to the division hospital. Since arriving in camp Lieutenant Heidersheide had noticed that continued fever prevailed more in some companies than in others. He thought that it was more prevalent in Company G when he first arrived; and Company L had considerable sickness. Company B is suffering quite a run now. When he first arrived he noticed that some companies were especially free from it, Company I being one of the latter. Questioned as to the localities from which the different companies came, Lieutenant Heidersheide said that four companies are from Milwaukee, Wis., but he could not say whether they were especially susceptible. One company, K, had not had very much fever. He believed the greater prevalence of typhoid fever had been among those companies from the smaller towns and rural districts. As to the influence of nationality,

Lieutenant Heidersheide stated that a Polish company is quite hardy; but he found, on the contrary, that a great many Scandinavians were not, and when the latter get the disease it goes hard with them. There are no companies almost exclusively composed of Scandinavians. The Scandinavians and Germans are pretty generally scattered throughout the companies. Company I is pretty generally Irish, and it is the lively company of the regiment; they are the life of the camp. They have escaped typhoid, and they say it is beer that causes the fever. The Milwaukee companies do not get consignments of beer from Milwaukee. Some companies have beer in their tents, but I do not think it came in consignments.

At the present time there is considerable diarrhea, but no dysentery, among the men. This seems to be limited more to some companies. "It is that typhoid diarrhea in the start." Lieutenant Heidersheide wished to say a word in regard to diagnosis: "When these diagnosis slips were sent out with the men to the division hospital with the first cases we did not hold the men long enough to be able to diagnose whether it was typhoid or malaria. I was instructed when the temperature ran to 101° to send them to the hospital. I could not diagnose a case as soon as that. Where there is no nosebleed or no rose spots I could not make a diagnosis. They (the hospital authorities) said it was not necessary. They would put on the slip 'Diagnosis pending.' Therefore we have not any way to make diagnosis. I believe them to be typhoid fever. One man I sent to the division hospital died from perforation the second night after he was sent there. This man came to sick call some five successive days. I then encountered him stretched crosswise on a mattress opposite to his tent, outside of his quarters. He said he was there because it was cooler. He was sent to division hospital that day. This man had been walking on the company streets. It was a case of walking typhoid and one of typical 'bowel-fall' diarrhea." One of the members of the board commented: "Worst of all, he had been defecating in the tubs."

Lieutenant Heidersheide remarked that when he first came to Jacksonville the men had a marked antipathy to the hospital, but this disposition was now much less. Some of the men who have returned from hospital have spoken well of their treatment there, and this has produced a good effect among the boys.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE FIRST WISCONSIN VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. Leverett N. Persons, commanding Company C, furnished a list of men as they were grouped in their tents in the first camp at Jacksonville, and stated substantially as follows: In our first camping ground at Jacksonville, where we remained until the latter part of July, each company's tents were

in a single row. We moved to a new camp ground in July, where the company then pitched their tents on each side of their own company street. The list showing the grouping of the men in tents is given for the first camp ground, because it was there that our company was infected with typhoid fever. There were practically no new cases after the removal of the regiment to the new ground. This company was located on the west side of a north and south road constructed of oyster shells, and the tents were about 20 feet from the edge of the dust in this road until about July 12, when they were moved 50 feet farther west.

The First Battalion consisted of the band and Companies G, B, F, and C, all on the west side of the shell road; Second Battalion of Companies H, E, D, and A; Third Battalion of Companies I, L, M, and K.

(N. B.—Captain Persons has made a mistake as to the points of the compass. The direction of the shell road of which he speaks is east and west, his company and battalion lying upon the north side of that road instead of the west side.)

Company C was not on any detached service. Sixty-five of the men of this company, including officers, were residents of cities at the time of enlistment, though many of them were recently residents of rural districts. The men were about the medium in intelligence, and I believe as a whole they were reasonably careful in diet, and they were certainly cleanly in habits. The few that might be accused of some dissipation were remarkably fortunate in preserving their health; indeed, the extremely imprudent and the most dissipated escaped the fever entirely. The financial status of the men of the company was about the average.

I do not know that our company suffered much more with typhoid than some of the other companies of this regiment, but we were certainly infected with typhoid fever as a whole in advance of the other companies. I am not competent to compare our condition with that of other companies, for I was too much occupied with our own sick to inquire much about the condition of others or charge my memory with what I heard of them. In my opinion our nearness to the shell road, its unceasing traffic and consequent dust, the prevailing winds blowing direct toward our side of the road, and the method of disposing of feces from the sinks were the chief causes of the extensive typhoid infection in my company.

The disposal of fecal matter from the sinks was by hauling in tubs, filled to overflowing and constantly slopping and spilling along this (shell) road within 20 feet of our tents, and generally at mealtime. It was impossible to keep the dust out of our food, and the passing of these filthy and vile-smelling wagons while the men were eating was almost in itself cause enough for sickness, even had infectious germs been absent from the loathsome loads. We did not suffer this without protest, verbally on my part. I finally suc-

ceeded in obtaining a new camp ground, as before stated.

Capt. William Mitchell Lewis, commanding Company F, furnished a list of his men grouped in their tents, and stated substantially as follows: Our tents were all laid out in one line on one side of the street, except about two weeks, during which latter time they were formed in two lines facing each other. This was, however, only while the company was on detailed service. The grouping of companies in battalions was as follows (the name and order of the battalions is not given): Companies G, B, F, C; H, A, E, D; I, L, M, K.

Company F was detailed on provost-guard duty in the city of Jacksonville from July 30 to August 14. Upon the latter date the company moved to Pablo Beach, still on provost duty, where they remained until August 27, when they returned to the regimental camp.

This company came from an urban population entirely. The average intelligence of the men was very high. They were reasonably prudent as to personal conduct and habits affecting their health. The financial status of the company was above the average.

I think that Company F suffered less from typhoid fever than any other company in the battalion or regiment. We had the misfortune to lose three men from typhoid fever, but in several instances this company was able to turn out more able-bodied men than any company in the regiment. To more fully express the conditions it would be fair for me to state that when the regiment left for Wisconsin on September 6 Company F had four men absent on furlough and the others were able to accompany the regiment home, with the exception of one man who was left in charge of his mother in the division hospital at Jacksonville, and he followed the company to its home station in about two weeks. This was the only company to take home with it such a large number of its men.

Capt. H. W. Quentmeyer, commanding Company G, furnished a list of men grouped in their tents, and stated substantially as follows: The First Battalion consisted of Companies G, B, F, and C; Second Battalion of Companies H, A, D, and E; the Third Battalion of Companies I, L, M, and K.

This company was not upon any detached service. The men were from an urban population, and were of medium intelligence, reasonably prudent, and were above the average financial status. This company did not suffer more from typhoid fever than did other companies.

Capt. Theodore Wild, commanding Company K, furnished a list of men grouped in their tents, and stated substantially as follows: The tents were on opposite sides of the street; odd numbers on the right looking down from the officers' tents toward the kitchen. An alley about 8 feet wide separated the odd-numbered

tents of Company K from the even-numbered ones of Company M. The tents occupied by the company were of an unequal size; some measured 10 by 12 feet, some 12 by 14 feet, while most of them measured 9 by 9 feet. This description of tentage and their occupants refers to our second and last camp at Jacksonville, which we pitched about July 29. Our former camp at Jacksonville, which we pitched May 22 or 23, was situated about 1 mile east from the site of our last camp. In that first camp the tents of each company were arranged in a single row, but I can not give the exact grouping of men in them.

The Third Battalion, of which my company was a member, camped on the extreme left of the regiment, and the four companies were arranged in the following order from right to left, to wit: I, M, L, and K. My company, K, was located on the extreme left of the regiment. To the left of my company there was an open space of about 250 feet in width, ending abruptly in a ravine, in the bottom of which there slowly ran a creek. No trees were in the open space nor were there any in camp, but trees and underbrush grew in the ravine.

The members of my company came exclusively from an urban population. The average intelligence was medium, and average education low. The men were generally pretty prudent as to personal conduct and habits affecting their health. Their financial status was far below the average.

My company was the last to become afflicted to an extended degree with typhoid fever, and suffered, on the whole, less than did other companies in the regiment. In my opinion the causes of this fortunate state of affairs were many, and I shall state them as concisely as possible.

(a) I explained to my men timely, thoroughly, and repeatedly the dangers of the semitropical climate and the necessity of observing the sanitary rules and precautions as promulgated in several circulars issued by the Medical Department. I insisted on their leading an abstemious and decent life. They believed me and did as I told them.

(b) I never required of my men any work in the sun beyond such as was absolutely necessary; and I cautioned them to keep out of the sun, and they did so whenever possible.

(c) During practice marches or maneuvers no man of my company would dare to fall out and drink from any well by the way, nor was there any man required to turn out for any drill or maneuver if he did not feel perfectly well. In other words, strictest discipline prevailed, but the treatment of the men was humane.

(d) The tents in my company were on stilts, and men were enjoined not to dig in the ground.

In this connection I beg leave to submit the following result of my close though not professional observation.

Exposure to the tropical or semitropical sun brings on malaria, and this weakens the system and renders it prone to the prevailing typhoid fever.

Proof A: On a certain day about the middle of the sickly month of August (date not recollected), I had one man in the division hospital. The next day the company was ordered to the rifle range, distant one hour's march. No shelter from sun on range; the men were exposed to the sun from 7 a. m. to 3 p. m. Within the next three days about a dozen of my men were taken to the division hospital.

Proof B: The regiment, ordered to be returned from Jacksonville to Milwaukee, struck camp about 6 a. m. September 6, 1898, marching in heavy marching order $1\frac{1}{2}$ miles to the railroad train in the hot sun in the sickliest month in Florida. My battalion waited in the open air for the third section of train, men exposed from 6 a. m. until sundown. On the way to and upon arrival at Milwaukee about a dozen of my men were taken sick. Climatic conditions being different and men being segregated in Milwaukee, but a few developed typhoid—most of them had malarial fever.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORT.

May.—(Camp Harvey, Milwaukee, Wis., and Jacksonville, Fla.) Mean strength averaged for eighteen days: Officers, 50; enlisted men, 973; total, 1,023. Admitted from command, 1; total to account for, 1. This case was transferred to another hospital.

Abstract of remarks by T. W. Evans, major and surgeon.

The First Wisconsin was assembled at Camp Harvey, Milwaukee, Wis., on the 14th of May, and remained there until May 20. Was then ordered to Jacksonville, Fla., to join the Seventh Army Corps. Arrived at Jacksonville May 23. Assigned to the Second Division, Second Brigade, stationed at Camp Cuba Libre.

Health of regiment and sanitary conditions of camp good.
Distance traveled by rail about 1,500 miles.

June.—(Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 53; enlisted men, 1,029; total, 1,082. Admitted from command, 45; total to account for, 45. Of 44 completed cases 13 returned to duty, 31 were sent to other hospitals. Remaining on sick report in quarters, 1.

Abstract of remarks by T. W. Evans, major and surgeon:

Health and sanitary conditions are very good.

One man, Company D, died at St. Luke's Hospital June 14, 1898; cause of death not stated.

July.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 50; enlisted men, 1,272; total, 1,322. Remaining from last month, 1; admitted from command, 142; from other sources, 4; total to account for, 146. Of 133 completed cases 22 returned to duty, 111 transferred to other hospitals. Remaining on sick report in quarters, 13.

Abstract of remarks by T. W. Evans, major and surgeon:

At Camp Cuba Libre, during the month of July. Moved camp 1 mile southwest, to better sanitary conditions of regiment, on the 29th of July.

Prevailing diseases are malarial and typhoid fevers.

Sergeant of Company F died at Second Division Hospital July 13 of typhoid fever.

Two men of Company C died of typhoid fever in the Second Division Hospital on the 14th and 18th of July, respectively.

August.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days—officers, 50; enlisted men, 1,253; total, 1,303. Remaining from last month, 13; admitted from command, 291; total to account for, 304. Of 304 completed cases, 59 returned to duty; 245 were sent to hospital.

Abstract of remarks by James B. Whiting, jr., acting surgeon:

Regiment located at Jacksonville, Fla., at Camp Cuba Libre, 1 mile northwest of the city, on Fifth street.

The prevailing diseases are malarial fever, typhoid fever, and acute diarrhea.

Two men of Company C died of typhoid fever at the Second Division Hospital on the 2d and 3d of August, respectively. One man of Company G died at the same hospital August 6 of typhoid fever.

September.—(Camp Cuba Libre, Jacksonville, Fla.) No data given in indorsement of this report, save the total of diseases for the month, which was 37, of which typhoid fever contributed 19. Report is signed by Maj. T. W. Evans, surgeon of the First Wisconsin.

CONSIDERATION, BY THE BOARD, OF TYPHOID FEVER IN THE FIRST WISCONSIN VOLUNTEER INFANTRY.

Brief outline of the medical history.—This regiment assembled at Camp Harvey, near Milwaukee, Wis., April 28, 1898, and remained encamped there until the 21st of May, on which latter date it left by rail for Tampa, Fla., but while en route was diverted by telegraphic orders to Jacksonville, Fla. On the 24th of May the regiment arrived in Camp Cuba Libre, was assigned to the Second Brigade, Second Division, of the Seventh Army Corps, and went into camp with the Fiftieth Iowa and Fourth Illinois—both at first members of this brigade—in the suburb of Springfield, upon a site located within the corporate limits of the city of Jacksonville, Fla. It is noteworthy here that a certain "shell road," or street, running east and west, passed through this first camp of the First Wisconsin at Jacksonville, forming one of its battalion streets, and that along this battalion street, or "shell road," passed the open scavenger carts carrying loathsome and doubtless infected freight from the latrines of other regiments (two or more) and from those of the Second Division Field Hospital to the fixed dumping place for this division. (See sketch map of Second Division, this corps, and diagram map of this regiment.) The regiment remained encamped on both sides of this "shell road" without shifting ground until July 29, when it

moved to new ground about a mile westward (see general sketch map of Seventh Corps at Jacksonville, Fla.), followed there the next day by the Fiftieth Iowa, the Fourth Illinois probably remaining behind on its original camp site until the 13th of August, when it was transferred to the Third Division. On the 8th of August, while encamped on this new ground, the brigade was joined by the Ninth Illinois, just arrived from its State camp. (See histories of these regiments.) The First Wisconsin probably remained in its second camp without moving again until it left Jacksonville for Milwaukee, about the 7th of September, preparatory to muster out. No medical record obtainable by the board carries the history of this regiment beyond its departure from Camp Cuba Libre homeward bound. We learn that it was mustered out of the service of the United States on the 19th of October, 1898, at Milwaukee, Wis.

Its medical history by the board covers a period of only four months and ten days. Of this time, the regiment was in the State camp twenty-four days; en route by rail to Florida, three days; in the national camp at Jacksonville, Fla., from May 24 to September 7, or one hundred and six days, of which the first sixty-six were spent in the first camp on either side of the "shell road" above mentioned, and the last forty days were passed in the second camp at Jacksonville.

Although the medical officer in charge of the First Wisconsin at the time of the inspection by the board testified that as far as he knew there had been no typhoid fever in the command while it was in the State camp near Milwaukee, we have been able to ascertain that the first attack of typhoid fever in the regiment began on the 14th of May, seven days before the departure from Camp Harvey. This, however, does not seem to have been followed by others until the 21st of June, the date of an attack of probable typhoid, and the 25th and 29th, respectively, when the first suspicious cases of prolonged fever apparently began. There is therefore room to doubt if the beginnings of the epidemic of typhoid fever which this regiment experienced while at the national encampment were connected in any way with the single case starting as above pointed out at least a week before the command left the State camp. It should be borne in mind, however, in this connection that in the Second Wisconsin, which was at Camp Harvey at the same time, the first case of probable typhoid developed while at that camp, viz, on the 11th of May, and that an outbreak of typhoid fever occurred in the same regiment two weeks after its arrival at Chickamauga Park. Furthermore, the Third Wisconsin, which also went from Camp Harvey to Chickamauga Park and was likewise at the State camp during the same early period, seems to have reached the national camp "quite widely infected with typhoid fever."

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal dis-

orders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the commencement of the attacks were recorded as closely as they could be ascertained. We would also invite especial attention to the course of the epidemic in Company C on the north or leeward side of the battalion street of the first camp at Jacksonville, Fla.

[First Wisconsin Volunteer Infantry; mean strength, 1,232.]

Month.	Intestinal disorders				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	
May.....								1	1
June.....	14			14	22	2	1	3	1
July.....	6		1	7	36	30	2	57	39
August.....	20	1		21	48	35	24	143	202
September.....					11	2	7	8	17
Total.....	40	1	1	42	117	69	34	209	312
									46
									48

A rectification of the total number of so-called long malaria, as given in the above summary table by months, should be made by reducing the total of 69 to 68, thus requiring a corresponding reduction of the number of total probable typhoid attacks from 312 to 311.

The above tabulated deaths from disease by months were distributed among the companies of the regiment as follows:

	Company.												Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Typhoid.....	3	10	6	5	6	3	2	3	1	1	3	3	46
Other diseases.....				1			1						2
Total.....	3	10	6	6	6	3	3	3	1	1	3	3	48

The following is a series of three tables showing by companies, respectively, the attacks of typhoid fever, so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering), and (*b*) who have had such other attacks.

Combinations of typhoid fever in the First Wisconsin.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	29	20	19	17	12	7	15	20	7	9	19	14	3	191
Probable typhoid (uncombined).....		3		8	1		3	4	5	3	3	3		33
Typhoid beginning in diarrhea.....		1	1	1	1		1				1	1		7
Typhoid preceded by diarrhea.....					2						1			3
Typhoid preceded by malaria.....	2	1	2								1			6
Probable typhoid preceded by malaria.....							1							1
Combinations of three diseases.....			1					1						2
Total certain typhoid.....	31	22	23	18	15	7	16	21	7	9	22	15	3	209
Total probable typhoid.....		3		8	1		3	5	5	3	3	3		34
Total probable and certain typhoid.....	31	25	23	26	16	7	19	26	12	12	25	18	3	243

Combinations of continued or malarial fever in the First Wisconsin.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Short malaria (uncombined).....	13	10	10	3	8	4	7	8	9	5	10	9	.....	96
Short malaria followed by diarrhea.....				1									.....	1
Two attacks short malaria preceded by diarrhea.....			1					1					.....	2
Two attacks short malaria.....		1						1				1	.....	3
Two attacks short malaria and a long malaria.....							1						.....	1
Long malaria (uncombined).....													.....	
Long and short malaria.....	5	8	11	2	4	7	1	9	5	2	4	6	2	66	
Total short malaria.....	15	13	14	5	8	4	8	13	9	6	11	11	.....	117
Total long malaria.....	5	8	12	2	4	7	2	9	5	3	4	6	2	69	

Totals include malaria in typhoid combinations.

Intestinal disorders in the First Wisconsin.

	Company.													Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea.....	2	6	...	3	5	...	3	...	2	1	3	1	26	
Two attacks short diarrhea.....					1	...							1	
Prolonged diarrhea.....			1										1	
Total diarrhea.....	2	6	1	4	11	...	3	2	4	1	5	2	41	

Totals include diarrhea in malarial or typhoid combinations.

The records of sickness in this regiment were found to be imperfect, incomplete, and to some extent conflicting. By way of illustration: There were 22 names of soldiers from the regiment recorded in the hospital reports not found entered upon the regimental sick reports; and, vice versa, there were 23 names of men who appeared in the regimental records as having been sent to the division hospital, but which could not be found in the hospital reports. Furthermore, the medical records of this regiment reveal 8 cases of intestinal disorder, 38 cases of so-called short malaria, etc., and 42 cases of so-called long malaria, etc., whose final disposition is not recorded. How many of these incomplete cases were really typhoid fever, and should have been added to the total given in the above summary table, it is of course impossible for us to estimate. That there were at least some, possibly many, we think can not be reasonably questioned. Moreover, there was 1 fatal case of typhoid fever which we have not tabulated for lack of a proper initial date, and there were no less than 8 of the deaths from typhoid returned as such to the Adjutant-General's Office (most of them occurring after the regiment left Jacksonville, Fla., for home, preparatory to muster out) in soldiers of whom we have no sick record at all. In addition, it should be stated that we have obtained no medical records from this regiment after it left Jacksonville, Fla., about the 7th of September, for Milwaukee, Wis., preparatory to being mustered out, which latter event took place there on the 19th of October, 1898. When the regiment left for home and incidentally disappeared from our view its typhoid epidemic was in full progress,

as the foregoing tabular statement clearly shows; and we have strong reasons to believe that typhoid fever must have continued to spread among the men for some time. The above tabular statement must, therefore, be regarded as a decided underestimate of the prevalence of typhoid fever in the First Wisconsin. (See also, in this connection, the remarks of the chief surgeon of the Seventh Army Corps concerning this regiment, and in the introductory remarks at the commencement of the Second Division a general statement regarding the frequent neglect of regimental surgeons to report cases treated in quarters.)

The salient points of the medical history (including morbidity and mortality) of the First Wisconsin Volunteer Infantry as a member of the Second Brigade and Second Division may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Milwaukee, Wis., from April 28 to May 21; it was in the national camp at Jacksonville, Fla., from May 24 to September 7, changing its camp site July 29. On the 7th of September it left Jacksonville, Fla., for Milwaukee, Wis., preparatory to muster out, which latter event occurred there on the 19th of October, 1898. The initial date of the first probable attack of typhoid fever was June 21 and of the first certain attack of typhoid fever May 14, there being no suspicious attacks between the two. Although the first case of typhoid made its appearance seven days before the regiment left the State camp for Jacksonville, Fla., there is room to doubt if the first case gave origin to the epidemic of typhoid fever in the regiment. The medical history by the board covers a period of four months and ten days (from April 28 to September 7, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorder, 42; of so-called short malaria, etc., 117; of so-called long malaria, etc., 68; of probable typhoid fever, 34, and of certain typhoid fever, 209. Total attacks of probable typhoid fever (long malaria, etc., included), 311.

(c) Total deaths from typhoid fever, 46; total deaths from all diseases, 48; mortality per cent of total probable typhoid attacks, 14.79; of total certain typhoid attacks, 22; per cent of typhoid deaths to all deaths by disease, 95.83.

(d) The mean strength was 1,232. The per cent of typhoid morbidity to mean strength: As to total probable typhoid attacks was 25.24, while the average for the brigade was 22.44; as to total certain typhoid attacks was 16.96, while the average for the brigade was 14.26. The number of typhoid deaths per 1,000 of mean strength was 37.33, while the average for the brigade was 26.81 and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers grouped by the diseases we have been studying, as well as of soldiers who have died of

typhoid fever, and we have obtained the following figures as to the First Wisconsin:

Disease.	Individuals.	Average age.
Short intestinal disorders	30	22.4
Long intestinal disorders	3	21.3
Total intestinal disorders	33	22.3
Short malaria, etc.	84	24.5
Long malaria, etc.	73	23.2
Probable and certain typhoid attacks.....	220	23.6
Probable and certain typhoid and long malaria	293	23.5
Grand total of all above classes	410	23.3
Thirty-eight soldiers who died of typhoid fever.....		22.6

For comparison of these average-age figures with similar data relative to other regiments in this brigade and division we refer to the general tables treating of this subject at the end of the Second Division of the Seventh Army Corps. (See also similar tables relating to certain regiments of the Second Army Corps at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

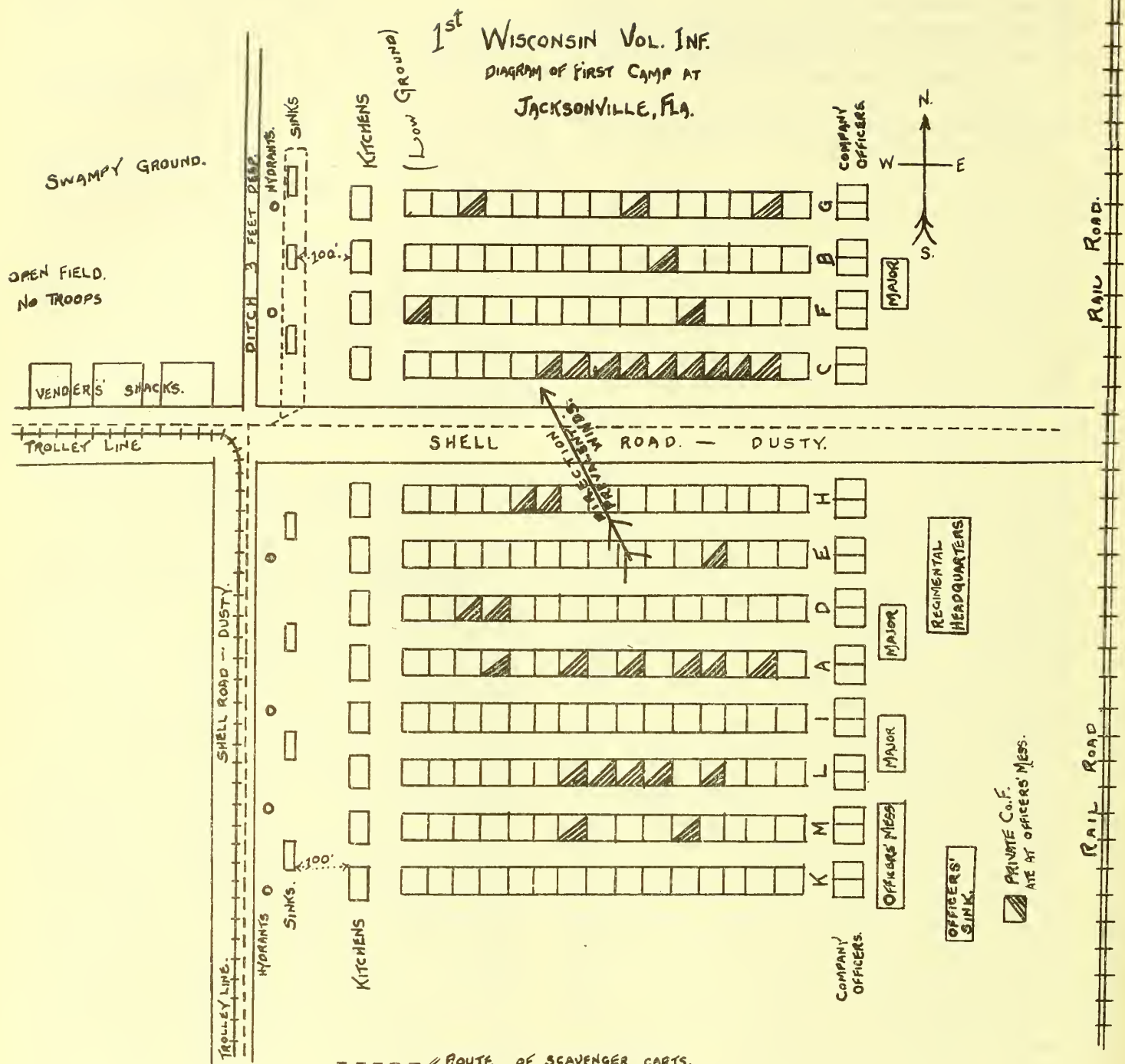
(a) As to the arrangement of the companies in battalions and the location of the latter there was some conflict of testimony, but, as near as we would establish it, the arrangement in the first camp at Jacksonville, and probably also in the second camp, there was, from north to south, as follows: Companies G, B, F, and C, in the north battalion; H, E, D, and A, in the middle battalion; I, L, M, and K in the south battalion. By glancing at the graphic chart it is at once seen, as to the course of typhoid fever in the four companies constituting the north battalion, that there was no synchroism either in the origin, course, or ending of the curves representing sickness in these companies. As to those companies constituting the middle battalion the same general statement holds, but the divergencies here are not so great as in the north battalion. Similar divergencies also exist in the lines representing the course of sickness in the companies constituting the south battalion. These dissimilarities in the course of company epidemics in the First Wisconsin would appear to be on their face incompatible with the assumption of a common, simultaneous, or more or less continuously acting agency as the chief means of propagation of the epidemic.

(b) As in other regiments of the division, the epidemics in the companies of this regiment had frequent greater or less exacerbations in their course; and the intervals between these exacerbations, as a rule, were more or less closely coincident with the average period of incubation of typhoid fever. (For the full discussion of this point refer to general remarks under the Second Division, Seventh Army Corps; as also general remarks under the Second Army Corps at Camp Meade.)

It is not necessary to especially elucidate this point by particular references. A close examination from this standpoint of the foregoing tabular statement and the graphic chart representing the course of sickness will more or less definitely substantiate this statement.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) Company L was the first company selected from the entire corps for provost duty, and "they were down in the city about three weeks, until they were worn out." (Dates not stated; but that company did not have a typhoid-fever outbreak for a month or more after their return to camp.) It appears that Company L was again detached from the command on provost-guard duty at Pablo Beach, Fla. (Here, again, the date is not given, but this latter service must have been some time between the 13th of August and the 5th of September.) Whatever the date of this latter service may have been, it seems to have had little influence upon the course of the typhoid-fever epidemic in that company. Company F was detached on provost-guard duty in the city of Jacksonville from July 30 to August 14. Upon the latter date the company moved to Pablo Beach, still upon provost duty, where they remained until August 27, then returning to the regimental camp. (The regimental camp to which this company returned at that date was, of course, the second camp of the regiment at the city of Jacksonville.) By reference to the graphic chart it is seen that they had one case of typhoid fever, beginning on the 5th of July, another on the 11th, and one on the 15th. Between the 20th and the 30th, inclusive, a number of attacks occurred. After the latter date there seems to have been only one more attack of typhoid fever in this company, which began on the 15th of August. The fact that the last case but one of the company epidemic occurred on the date of detachment of this company on provost-guard duty appears to furnish conclusive evidence that the infection of this company ceased several days before its separation from the battalion on the special service above mentioned. It thus seems that detached service could not have influenced the course of the epidemic in Company F. This company does not seem to have been reinfected while separated from the regiment. Company K is said to have been detached on provost-guard duty (place not stated) from July 9 to 16. With reference to this detached service, it may be stated that the period corresponds to the date of infection of only one case of typhoid fever, as may be seen by reference to the graphic chart. Since there were no other cases of serious illness in this company from the date of its return to the regiment up to the 5th of August, it may be safely assumed that the company did not become infected while on that detached service. This company appears to have been again detached from the regiment



from the 30th of August to the 5th of September at Second Division headquarters, on which latter date the regiment was ordered home. The graphic chart shows no attacks of typhoid fever developed within that period.

(b). Lieut. J. S. Wilson, assistant surgeon, U. S. Army, at the request of the board, prepared (with the aid of the regimental surgeon and the commandant of the Second Division Hospital) a general diagram map of the first camp of the First Wisconsin at Jacksonville, Fla., on which were specially indicated those tents occupied by men who were believed to have suffered attacks of typhoid fever previous to the 1st of September. (See accompanying diagram as corrected.) This diagram is introduced for several purposes. In the first place special attention is called to the location of a "shell road" with reference to two battalions of this regiment and the location of two companies in these respective battalions. In the north battalion it is seen that Company C lies on the north side of this "shell road," with the line of company tents about 30 feet from the edge of the road. Company H, in the middle battalion, lies upon the south side of the same road. This "shell road" is said to have been the thoroughfare along which traveled the loaded scavenger carts from the Second Division Hospital on the east of the regimental camp to a point in a sewer designated by the board of health of the city of Jacksonville as the general dumping ground for waste of the division, at a point on the west side of the division encampment. The route pursued by the scavenger carts through and near this regiment is indicated by the interrupted lines. Another point which should be borne in mind in an examination of this diagram in studying the course of fever in the First Wisconsin is the direction of the prevailing winds as indicated by an arrow. The constitution of this "shell road" was such that during dry weather and constant traffic it became very dusty, and it is stated that during dry weather the prevalent winds wafted clouds of this dust over the line of company tents lying on the north side of the road. By reference to the diagram it is seen that the company apparently most affected with typhoid fever in the regiment is that which is located on the north side of this road, namely, Company C. It is noteworthy that the appearance of Company H in this diagram, located upon the south side of this "shell road," is in marked contrast to Company C on the north side.

While considering this matter we would refer to the testimony of various officers of this regiment concerning the frequent splashing out of the contents of the scavenger carts along this "shell road." The opinion of the officers of the regiment appeared to be very strongly in favor of charging the infection of Company C to the infected dust from the adjoining "shell road." It should be noted at this point that about July 12 Company C moved 50 feet farther north from the "shell

road." Reference to the graphic chart will show that the course of typhoid fever in this company suddenly and markedly decreased eleven days after that date. Concerning the general impression of the officers of this regiment that the infection of this company was carried by the dust-laden wind, we may refer to the general meteorological chart for the city of Jacksonville during the period of the encampment of the Seventh Corps at that point. It should be borne in mind that a case of typhoid fever began on the 25th and 29th of June, respectively, and that there was a continual occurrence of new cases from the 2d to the 23d of July, inclusive, when, as before mentioned, the company epidemic suddenly and decisively decreased. The meteorological chart shows that from the 22d of June to the 2d of July, inclusive, there was no rain except a trace on three different days, and that the weather was hot and dry while the wind was southerly. This period corresponded to small daily wind movement, the average being less than 7 miles per hour. During this time only twice did the wind blow from a northerly point, for less than half a day each time. It should be pointed out here that the commencement of the incubation period for the first isolated cases above mentioned probably occurred between the 17th and 21st of June, inclusive, when there was more or less rain on each day, the rainfall being considerable on three days of that short period. With regard to the possibility of the winds transporting infection from the "shell road" to the tents of Company C it must be borne in mind that from the 4th to the 15th of July, inclusive, there was rain every day, and that on the 8th, 11th, and 12th there was a rainfall of 1.75, 2.30, and 3.09 inches, respectively. Thus it is seen that the only period when the prevalent winds could have played any considerable rôle in the infection of Company C with respect to its epidemic of typhoid fever must have been between the 22d of June and the 3d of July. It may be remarked that it could not have become excessively dusty again after the twelve days of rain above mentioned before the removal of Company C to a greater distance from the "shell road." It seems possible, therefore, that the origin of this peculiar epidemic in Company C may have been related to infected dust from the "shell road," carried by the prevalent winds. On the other hand, with regard to Company H, located upon the south side of this road, reference to the chart shows an isolated attack of typhoid fever on June 21; another isolated attack of probable typhoid fever on July 10. A series of 4 attacks occurred from July 20 to 27, inclusive. There were 2 attacks on the 6th of August, and on the 10th of August a decided epidemic of typhoid fever in this company begins, and continues until the disappearance of the company from view with the departure of the regiment from Jacksonville for home on the 5th of September. With regard to the possibility of wind carrying

infected dust from the "shell road" into the tents of Company H, the following appears by reference to the general meteorological chart: Three days before the occurrence of the first attacks on June 21 the wind blew from the northwest in the morning, but this was during rain, and therefore could not have carried infected dust into the tents on that date. From the 5th to the 9th of June, inclusive, the wind blew from a northerly quarter. On the 3d and 6th of June, respectively, there was some rainfall. Thus it is seen that the only date possible for infection to have been carried by the wind into the tents of Company H, in order to cause the infection of the first case mentioned, was four or five days preceding the attack by a period of thirteen days or more. With regard to the second attack on the 10th of July; during the preceding three weeks the wind blew from the north only once—on the morning of the 4th of July. This was during a period of hot and dry weather, when it was possible for the wind to have carried dust. With regard to the occurrence of the 4 cases between the 20th and 27th of July, inclusive, it should be remarked that during the time corresponding to the commencement of the respective incubation periods of these cases the wind blew from the north on only one or two occasions, but then there were heavy rains, and there could have been no movement of dust. With regard to the 2 cases occurring on the 6th of August, it may be remarked that the wind was from the north on the evening of the 25th of July, corresponding with considerable rain; and again northerly on the evening of the 29th of July, still during a period of rainfall; and once more from the north on the 4th of August, this time during a period of dryness. It is therefore improbable that these cases could have owed their origin to the infection of the tents by dust laden with germs. With regard to the possibility of infection by dust carried by the winds to the tents of the men who fell sick between the 11th of August and the 5th of September, respectively, the following is to be noted: On the evening of the 29th of July, and in the morning of the 31st the wind blew from the north during a time of rainfall. Between the 29th of July and the 1st of August this regiment removed from its first camp to its second site about a mile distant, thus removing Companies H and C as well as all others of the command from the peculiar local conditions indicated in the diagram map above mentioned. The course of this company epidemic between the 11th of August and the 5th of September should therefore be considered apart from the influence of any exceptional conditions which may have prevailed in the first camp. It is therefore probable that dust-laden winds had nothing or little to do with the infection of the tents of Company H, which lay on the south side of the above-mentioned "shell road." While the theory of the movement of germ-laden dust may appear more or less plausible in sug-

gesting a mode of infection of Company C of the north battalion, there is one striking peculiarity as to the location of affected tents in this company, which the wind theory does not appear to account for satisfactorily. We refer to the striking fact that nearly all of the disease in this company was located in tents constituting that half of the company nearest the officers' quarters. Why the tents nearest the kitchen should have escaped the influence of this supposed germ-laden dust it is impossible for us to explain.

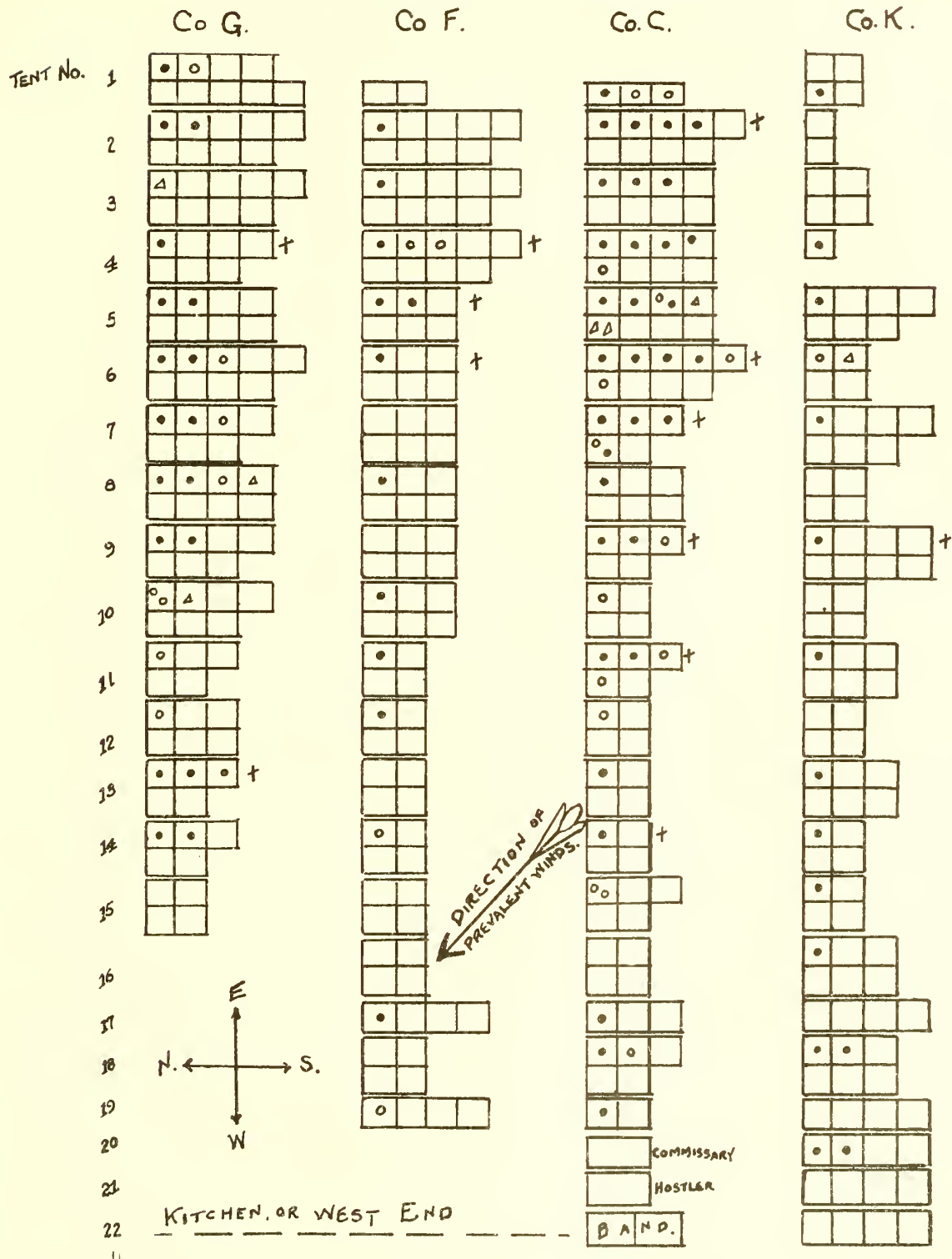
While considering the possible effect of dropping infectious material along the "shell road" separating the north and middle battalions of this regiment, it may be well to examine for a moment the possibility of carrying infectious material on the heels of the soldiers from this infected road to their tents; thus providing for the subsequent infection of the occupants. As to this possibility it may be suggested that theoretically there should be but little difference in the liability to this mode of infection between the tents lying upon either side of the "shell road." For we may assume that there was at least as much walking of soldiers from the infected "shell road" to the tents on the south side of that road as to the tents on the north side. Viewing the possibilities of such a mode of infection, we may also assume that a greater amount of infected material was likely to have been carried upon the heels of the soldiers moving from the "shell road" to their tents during wet and muddy weather than during dry and dusty weather. This suggestion would seem to call for a comparison of the meteorological chart with the graphic chart representing the movement of the epidemic among the companies. Without going into details in this matter, we may say generally that it sometimes happened that exacerbations in the course of the company epidemics coincided more or less closely with the end of an average incubation period, counting from a time of wet and muddy weather. Theoretically we may assume with regard to the transportation of infected mud on heels of soldiers moving from the infected road to their tents that the greater the distance traversed between the road and the tents, the less the amount of infectious matter upon the heels when the tents were reached. In other words, that the nearer the company street to the supposedly infected road the greater the liability of infection being transported on the heels of the soldiers. Assuming, for the sake of argument, the active agency of such a mode of infection, we should expect to find the greatest number of infected tents nearest the "shell road" on both sides of the latter.

An examination of the diagram above mentioned and a study of the course of the company epidemics throughout the regiment does not seem to warrant the conclusion that this mode of infection played any important part. Such a theory can not be compatible with the

DIAGRAM of COMPANIES C, F, G & K of 1st WISCONSIN

SHOWING NUMBER OF INDIVIDUALS IN TENTS, AND THOSE ATTACKED WITH TYPHOID FEVER, ETC. CONSTRUCTED IN PART FROM DATA FURNISHED BY THE COMPANY COMMANDERS.

HEADQUARTERS, OR EAST END.



□ = AN INDIVIDUAL IN A TENT. ● = AN ATTACK OF TYPHOID FEVER. ○ = AN ATTACK OF FEVER LESS THAN 10 DAYS (MALARIA, ETC.).
 △ = AN ATTACK OF INTESTINAL DISORDER. † = DEATH BY TYPHOID FEVER. TWO OR MORE SIGNS WITHIN THE SAME SQUARE
 INDICATE CORRESPONDING ATTACKS IN THE SAME INDIVIDUAL.

N.B.: Co. C LAY ON THE NORTH SIDE OF THE SHEL ROAD ALONG WHICH THE SCAVENGER CARTS SPLASHED OVER. NOTE DIRECTION OF PREVALENT WINDS. NOTE THAT 7 TENTS OF Co. C NEAREST HEADQUARTERS HELD 50 INDIVIDUALS, OF WHOM 22, OR 44% HAD TYPHOID FEVER; WHILST THE 15 TENTS NEAREST THE SINKS HELD 55 INDIVIDUALS, OF WHOM ONLY 10, OR 18.18% HAD TYPHOID FEVER.

almost complete absence of an epidemic in Company H previous to the removal of the regiment from that camp site. But before leaving the consideration of this idea of conveyance of infection upon the heels of the soldiers, we may for a moment refer to its bearing upon the already mentioned relative freedom of infection of the ends of the company lines of tents nearest the sinks. It must be admitted as indubitable that from the time an infected soldier began depositing his feces in the sink which his company frequented, the possibility of infection from this source commenced and increased in proportion as the number of infected soldiers frequenting the sinks increased, in the absence of any systematic effort to disinfect the feces. What has been said as to "the greater the probability of activity in this mode of infection, the shorter the distance traversed by the soldiers carrying infected matter upon their heels between the place of lifting it and depositing it in his tent," applies with equal force to this situation. Theoretically, the tents most liable to infection in this manner should be those nearest the company sinks. Yet it is just these tents which in this regiment appear to have been least affected, at least during the time of the first camp.

SPECIAL CHARACTERISTICS OF CERTAIN COMPANY EPIDEMICS AS EXHIBITED BY GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN THEIR TENTS, VIEWED FROM THE STAND-POINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) The squad groups of the sick as plotted in their respective tents would seem to be incompatible with the assumption that the chief factor in the propagation of typhoid fever infection throughout the companies in question may have been some agency whose influence was common and pretty constantly acting upon the whole company; on the contrary, they would appear to suggest a mode of disseminating infection which more effectively reached and acted upon certain limited groups or squads of men while it passed by others, and which would be entirely compatible with the assumption of a dominating tent, squad, or comrade infection. As already stated in the history of the Second New Jersey, and in the general remarks at the head of the Second Division, we have endeavored to ascertain the names of soldiers as they were grouped in their company tents during the period of the first encampment at Jacksonville, in order to examine into this important question. To this end we have requested such data from two different sources, namely, from the regimental surgeons and from the commanding officers of companies. The information upon this point which we have received was obtained from the commanding officers of four companies—C, F, G, and L. Having obtained the names of the men as grouped in their

tents, we were able to trace the recorded medical history of those persons affected, and in this manner to plat in the respective tents the attacks of typhoid fever and of other related illness. While in the first camp at Jacksonville the tents of the companies of this regiment were located upon one side only of the company street. (See accompanying diagram of Companies C, F, G, and K, with sick soldiers platted in the tents.)

(b) A further indication of the existence and active influence of a tent, squad, or comrade infection in this command is the following result of a careful analysis we have made of the records of sickness in Companies C, F, G, and L of this regiment in connection with the grouping of the infected men in their respective tents and the average time elapsing between successive attacks in the same tent and in adjoining tents. In these four companies there were 89 attacks of typhoid fever platted, of which there were 59, or 66.29 per cent, whose initial dates were found to be separated by periods corresponding more or less closely with the average incubation period of typhoid fever.

(For more details concerning this matter we refer to the tables showing the number and per cent of connectable typhoid fever attacks in tents as deduced from captains' lists of the Second Division of the Seventh Corps. For comparison with similar data furnished by the Second Army Corps, refer to a similar table under that corps. See also general discussion of this subject.)

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation in this disease from data obtained from two different sources, and we have found in the general average a striking coincidence in the figures thus obtained:

(a) Period of incubation as deduced from the length of intervals between successive or "connectable" attacks of typhoid fever occurring in the same or in adjoining tents. In 89 attacks platted we have obtained 43 intervals from which the average period of incubation might be calculated, and we have found it in these 43 instances to average ten days.

(b) Period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid fever attacks. The First Wisconsin furnished only two examples of diarrhea preceding typhoid fever by intervals which could be fairly regarded as measuring the period of incubation. The average length of the interval or period of incubation in these two cases was seven days.

N. B.—For similar data concerning other regiments of this division, see the tables of the Second Division of the Seventh Army Corps relative to this subject and similar tables of the Second Army Corps.

SECOND VIRGINIA VOLUNTEER INFANTRY.**Third Brigade, Second Division, Seventh Army Corps.****ABSTRACT OF SURGEON'S TESTIMONY BEFORE THE BOARD.**

[Maj. C. C. Peyton, surgeon.]

Richmond, Va.—The regiment was mustered in at Richmond, Va., on the 11th of May, and was assembled there a few days prior to that time. The regiment remained in camp there until the 1st of June. During that time there were a great many cases of measles. Typhoid diagnosed as such was just starting before leaving that camp, but these cases were hardly sick enough to leave behind. Nothing was left behind except measles. "I think if we had stayed at Richmond three weeks longer we would have had a hospital full of typhoid." The sanitary condition there was not good. The location of the site of the camp was bad. Running through the middle of the camp was a ditch from which a disagreeable odor emanated, although we cleaned it out every day. The water supply we had while in that camp was that of the city of Richmond, distributed in pipes tapped by hydrants. The men would wash their hands and dishes at the hydrants and the water would drain into this ditch. In addition to this there were three wells used for a while, but "I had them closed up." These wells were old and were from 30 to 40 feet deep. The men used this well water because it was clear and the city water was muddy. The wells were those belonging to the fair grounds, in which we were encamped, and "mine being the ranking regiment, I had control, and closed these wells up." Various companies of the Second Virginia showed symptoms of the development of typhoid. No company was more affected in this particular than others. "I have, however, noticed that several men from the same tent were infected, and consequently would move them out quicker and send them to the hospital. We mostly had the conical tents, sometimes as many as twenty-four or twenty-five men in a tent."

Jacksonville, Fla.—The regiment arrived at Jacksonville on the 3d of June and went into camp right across the street from the Second New Jersey, Second Illinois, and the First North Carolina, the Second New Jersey being directly south of us and the First North Carolina directly east. The character of the site of our camp was exactly the same as that of the Second New Jersey. A part of the Third Battalion is on lower ground next to the North Carolina. There are two ditches on the line between us and the North Carolina, one of them for our use and the other for the use of that regiment. "And they are very disagreeable from their foul condition." The water pipes for the supply of the regiment were already laid when we arrived, and there was no other supply than that furnished by the city of Jacksonville. The regiment is still using the conical wall tents with about the same number of men

to a tent as already mentioned. At first lumber could not be obtained for flooring the tents, and the men had to sleep on the ground, and there was great difficulty in obtaining copperas and lime. The regiment had a canteen, and shacks in its neighborhood were not permitted. The First North Carolina had a canteen right across the street from our regiment. Our men were not permitted to resort to these shacks; we kept a strict guard. Neither did we allow a watermelon or anything of the kind to come into the camp. "I was positive that stuff would make the men sick."

The tub system was used for the disposal of fecal matter. These tubs were in battalion sinks. The sinks were fully 50 yards removed from the nearest mess tents. These tubs were kept in very good condition and removed twice a day as a rule. "I have never seen them overflowing. I have made it a point to see that the tubs were removed with this frequency all the time. They did let the urinal overflow once, but it was because it rained hard. I have, however, seen slopping out of the contents of the tubs as they were being hauled along the street between the Virginia and the North Carolina regiments; that was the usual course the scavenger wagons pursued. They carried off this stuff about half a mile and dumped it into a city sewer."

The regiment obtained its water from the hydrants running into its encampment. These hydrants were located along the line of the street along which the trolley cars ran, parallel to the line about 30 feet from the eastern end of the company street. Bath houses for the use of the men were established along this line of hydrants, one for each battalion; that is, when we first came to that camp. "But I saw that this would not do, so I put all three of the bath houses over a sewer and thus got rid of the running water." The line of these water taps was about 20 feet from "the ditch" and into the latter the water from the bath houses ran. Surgeon Peyton had no knowledge of the water supply of the regiment being turned off temporarily by the Jacksonville authorities and according to his recollection there never was a time when the whole system had been turned off, although he admitted that this might have been possible for an hour or two.

In the new camp, after removal from the old site, the Second Virginia was located near the Fourth Virginia and the Forty-ninth Iowa, having about the same relation to them as in the old camp. In the new camp the regiment has been using the same system of disposal of feces. The sinks here, however, are much farther away from the mess tents. They are now probably 300 yards from them, and there is more room generally for the regiment. This removal occurred about the 14th of August and "I have not yet noticed any difference in the sickness. I consider that we have been very healthy. I think at the hospital we have the reputation of being the healthiest regiment in the whole corps."

We have recently been very little troubled with diarrhea and dysentery. On the contrary, at the present time constipation seems to be our trouble since coming to the new camp. We had much of this trouble at the old camp site. "I attribute it a good deal to the ditches and to the canteen. In the first camp the regiment was located along the trolley line and the men could then easily go to town. We are now (in the second encampment) located a mile and a half from the trolley line and it is more difficult for the men to get away."

We left no sick cases behind upon leaving Richmond, except those affected with measles, as has been said. We probably had a case or two of typhoid which had to go to the division hospital at Jacksonville immediately upon our arrival here, but we did not have many cases. Most of the cases which developed soon after our arrival here were those of malarial fever—never having at one time over 25 or 30 sick men. We have lost five men in the regiment since we have been here, all from typhoid. These fatal cases of typhoid were all labeled "malaria" when we sent them to the division hospital. Major Peyton could hardly say how many cases of typhoid these fatal attacks were derived from. Replying to the following question put by the board: "Don't you think most of these cases are typhoid, since the patients remained on sick report from three to six weeks?" Major Peyton said: "They convalesce very slowly, and from the division hospital they send them down to convalesce at Pablo Beach. I keep them in camp only long enough to diagnose. I never have over 20 or 21 sick in quarters, except these cases of typho-malarial fever." The surgeon had not noticed any difference as to the fevers since moving the site of the camp, which occurred about the 14th of August.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE SECOND VIRGINIA VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. R. E. Craighill, commanding Company E, stated substantially as follows: This company was a member of the First Battalion. The arrangement of the companies in this battalion was at first G, C, E, and K, and remained so until the regiment moved to its second site in the city of Jacksonville, August 13, 3 miles north of its first camp site, when the order was, according to the date of muster into the United States service, E, K, C, and G.

This company was detailed for duty at the rifle range August 24, returning to the regiment September 30. The range was about 2 miles northwest of Jacksonville. The company camp at this place was well located on a high piece of ground, but the ditch at the range, in which the men were obliged to stand all day in the hot sun turning and marking the targets, was in very bad order, having a foot or more of filthy stagnant water in places on the bottom. Up to this time my company

was remarkably healthy, but the work in the ditch caused a number of cases of typhoid fever.

Company E came from an urban population. The average intelligence of the men was comparatively high, and with few exceptions the men were reasonably prudent as to personal conduct and habits affecting health. The financial status of the majority was above the average.

Up to the time of the detail to the rifle range the company was one of the healthiest in the regiment. With a few exceptions the composition of the company was excellent. This class of men would naturally recognize the importance of observing the rules conducive to health after having their attention called to the matter day after day. The tents and company street were well policed and the food was well prepared. The location of the tents did not appear to affect the number of cases, nor did the habits of the individual men appear to render them more or less liable to attack. I allowed a number of men to erect wooden shacks in the rear of their tents, thereby thinning out the number of men in the tents to some extent.

Capt. E. W. Owens, commanding Company L, stated substantially as follows: My company was mustered in as Company L on May 29, 1898. It was composed of young men, none being over 30 years and the majority under 25. We arrived in Jacksonville June 2 with 82 men. Our tents were A tents, and I put three men in a tent, and made them buy cots to sleep on. In about three weeks our company was up to the limit, 106 men. My men enjoyed good health. I paid special attention to their tents, and made the men sweep them out every morning, and then sprinkled lime around the drains of the tents. The men kept good hours and drank very little. The only sickness my men had was bowel trouble. I lost one man with "malarial fever." This was the healthiest company in the regiment, due, I think, to the cots, which kept the men from sleeping on the ground. Some few of my men refused to buy cots, and I noticed that every last one of those who slept on the ground had fevers.

Company L was on provost duty ten days in the city of Jacksonville and fared badly on account of rain.

My company was from the "tide-water" section, and the climate at Jacksonville was about the same as we were used to at home. The 25 recruits sent after our arrival in Jacksonville were from the mountains, and they did not stand the climate as well as my old men did.

Much of the sickness in our camp was caused by the food furnished to the men. You should not expect a man to get up at 5 o'clock in the morning and eat three or four hard-tacks with a cup of coffee and go out in the hot sun and drill for three hours. I have often seen them drop out of ranks from exhaustion caused by the lack of food. If the Government desires to stop the raging of typhoid fever in camp, let it give the men more food. That, in my opinion, was the chief cause

of the fever in our camp. A great deal of the sickness in camp was caused by the neglect of the company officers in not looking after their men as they should. The best kind of tents to put troops in are the "wall" tents; these large (conical) round tents are "no good;" you have to put too many men together. The other companies in my regiment had them. Our regiment has the best record for health of any in the Seventh Army Corps. When my company was mustered out there was not one man sick, and no one has died since.

Capt. Cyrus G. Bassieux, commanding Company M, stated substantially as follows: The tents were placed in one line on the side of the company street; 18 men to a conical, and 3 to an A tent. The companies were grouped in battalions as follows: First Battalion, Companies E, K, C, and G; Second Battalion, Companies H, B, I, and M; Third Battalion Companies, F, A, L, and D.

This company was not on detached service. The men were about equally divided between an urban and rural population. Their intelligence was medium, they were reasonably prudent as to conduct and habits affecting health, and they were of the average financial status.

This company suffered less from fevers than did the other companies in this regiment. This, in my opinion, was due to the care given to the men, looking after their cleanliness, etc.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

May.—(Camp Lee, Richmond, Va.) Mean strength averaged for fifteen days: Officers, 45; enlisted men, 966; total, 1,011. Admitted from command, 42; total to account for, 42. Of 41 completed cases, 14 returned to duty; 27 were transferred to other hospitals. Remaining on sick report, in quarters, 1.

Abstract of remarks by Charles C. Peyton, major and surgeon:

Organized at Richmond, Va., May 21. Forty-five officers and 981 enlisted men. Went into Camp Lee, at Richmond, Va., May 10, remaining until May 31. Sanitary condition of camp not good. Health of regiment fairly good, measles and acute diarrhea being prevalent disorders.

June.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for twenty-eight days: Officers, 46; enlisted men, 1,112; total, 1,158. From last month in hospital, 1; admitted from command, 129; otherwise, 1; total to account for, 131. Of 122 completed cases, 76 returned to duty; 45 were transferred to other hospitals; 1 otherwise disposed of. Remaining on sick report, in quarters, 9.

Abstract of remarks by Charles C. Peyton, major and surgeon:

Regiment encamped at Camp Lee, Richmond, Va., June 1, at which time it left for Jacksonville, Fla. It arrived at Camp Cuba Libre June 3, traveling by rail about 980 miles in twenty-five hours. Regiment at Camp Cuba Libre from June 3 to June 30.

Sanitary condition of the camp excellent, a good sewerage system removing all standing water. Habits and health of the men have been fairly good, though in many cases they have been very imprudent as to eating and dressing.

July.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,201; total, 1,247. Remaining on sick report from last month, 9; admitted from command, 211; from other sources, 13; total to account for, 233. Of 215 completed cases, 176 returned to duty and 39 went to other hospitals. Remaining on sick report in quarters, 18.

Abstract of remarks by Charles C. Peyton, major and surgeon:

Encamped at Camp Cuba Libre since last report. Sanitary conditions of camp excellent. Habits and health of men have been fairly good, although some diseases can be traced to imprudence as to habits and diet. Prevailing disease, malaria.

August.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,235; total, 1,281. Remaining on sick report from last month, 15; admitted from command, 110; total to account for, 125. Of 125 completed cases, 73 returned to duty, 3 were discharged, and 49 were sent to other hospitals.

Abstract of remarks by Charles C. Peyton, major and surgeon:

Encamped at Springfield, Camp Cuba Libre, August 1 and remained there until August 16, at which time it was removed 2 miles farther east on shell road in Camp Cuba Libre and remained there until August 31.

September.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for twenty-two days: Officers, 46; enlisted men, 1,272; total, 1,318. Total cases to account for, 133. Of 131 completed cases, 18 returned to duty.

Signed by Charles C. Peyton, major and surgeon, who makes no remarks.

No reports for October or November found.

Regiment furloughed November 22, and no reports from first sergeants have been received since that date. Signed, W. E. Campbell, adjutant.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE SECOND VIRGINIA VOLUNTEER INFANTRY.

Brief outline of the medical history.—This regiment was mustered in at the State fair grounds at Richmond, Va., on the 10th of May, 1898, although it had assembled there a few days earlier (date not fixed). It remained encamped at that point until the 1st of June, when it started by rail en route for Jacksonville, Fla. It arrived at Camp Cuba Libre on the 3d of June, was assigned to the Third Brigade, Second Division of the Seventh Army Corps, and went into camp with the Fourth Virginia and Forty-ninth Iowa—the other two members of this brigade—in the suburb of Springfield upon a site located within the corporate limits of the

city of Jacksonville, Fla. It remained on this camp site until the 14th of August, when, with the other regiments of its brigade, it moved outside the city limits to new ground about 2 miles northeastward of its first camp. (See general sketch map of the Seventh Army Corps at Jacksonville.) On this new ground it remained until it left Camp Cuba Libre about September 19 for Virginia preparatory to being mustered out. No medical record can be found for this regiment subsequent to the 22d of September, although the adjutant states "regiment furloughed November 22 and no reports from the first sergeants have been received since that date," and the records of the Adjutant-General's Office show that the Second Virginia was mustered out of the service of the United States on December 16, 1898, at Salem, Va.

The medical history therefore covers a period of only four months and twelve days. Of this time, about twenty-one days were spent at the State camp in the fair grounds, Richmond, Va.; for two or three days the command was entrained while en route by rail to the national camp at Jacksonville, Fla.; it was in Camp Cuba Libre from the 3d of June to about the 19th of September (one hundred and eight days), during the first seventy-two of which on one camp site within the city limits of Jacksonville the rest of the time (thirty-six days) on another site without the city limits.

The Second Virginia brought with it to the national encampment at Jacksonville, Fla., from the State camp at Richmond, Va., the infection of typhoid fever. This is not only admitted by the medical officers of the regiment, but it is also borne out by the following medical history in detail:

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for the easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained.

[Second Virginia Volunteer Infantry; mean strength, 1,220.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	Typhoid.
May.....	10	2		12	12	2	2	12	22	
June.....	42	2		44	23	5	2	17	22	
July.....	75	2		77	23	14	2	38	54	1
August.....	20	1		21	33	5	11	38	54	1
September.....	7			7						
October.....										
November.....										2
Total.....	154	14		168	88	32	15	105	152	3

The above tabulated deaths from disease, by months, were distributed among the companies of the regiment as follows:

	Company.												Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Typhoid.....	4	1	1	2				2	1	2	1	3	17
Other diseases.....					1	1				1			3
Total.....	4	1	1	2	1	1		2	1	3	1	3	20

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attack (of the categories we have been considering) and (*b*) who have had such other attacks.

Intestinal disorders in the Second Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea.....	12	7	7	6	10	7	6	10	5	9	15	8		102
Two attacks short diarrhea.....														
Short and long diarrhea.....														
Single long diarrhea.....														
Long and short diarrhea.....														
Total diarrhea.....	22	9	10	25	14	10	11	15	9	15	18	10		168

Totals include diarrhea in malarial and typhoid combinations.

Combinations of continued or malarial fever in the Second Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined).....	7	8	7	7	3	3	5	3	7	1	6	9	1	67
Short malaria preceded by diarrhea.....	1		2	1			1		1					6
Short malaria followed by diarrhea.....								1						1
Two attacks short malaria.....		2	1						2		1			6
Short and long malaria.....					1									1
Long malaria (uncombined).....	4	4	2	1	4			2	3	3	1	4		28
Long malaria preceded by diarrhea.....				1	1									2
Long and short malaria followed by diarrhea.....	1													1
Total short malaria.....	9	12	11	8	4	3	6	4	12	1	8	9	1	88
Total long malaria.....	5	4	2	2	6			2	3	3	1	4		32

Totals include malaria in typhoid combinations.

Combinations of typhoid fever in the Second Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined).....	8	6	7	8	5	6	8	6	11	7	3	9	5	89
Probable typhoid (uncombined).....	1			2	1	5		1			1	1	2	14
Probable typhoid beginning in diarrhea.....												1		1
Typhoid preceded by diarrhea.....	4	1		4				2	2		1			14
Typhoid preceded by malaria.....									1					1
Combinations of three diseases.....									1					1
Total certain typhoid.....	12	7	7	12	5	6	8	8	15	7	4	9	5	105
Total probable typhoid.....	1			2	1	5		1			1	2	2	15
Total probable and certain typhoid.....	13	7	7	14	6	11	8	9	15	7	5	11	7	120

The records of sickness in this regiment were found to be very incomplete and to some extent conflicting. By way of illustration: There were 15 names of soldiers from this regiment in the hospital records which did not appear in the regimental monthly sick reports and, vice versa, there were 13 names of soldiers recorded in the regimental sick reports as having been sent to the division hospital which were not found in the reports of the latter. Furthermore, the medical records relating to this regiment reveal 5 cases of intestinal disorder, and 38 cases of so-called short malaria, etc., whose final disposition is not indicated. How many of these incomplete cases were really typhoid fever and should have been added to the total given in the above summary table it was of course impossible for us to estimate. That there were at least some, possibly many, we think can not be reasonably questioned. Moreover, we have left 5 cases untabulated for lack of proper initial date, 2 of which were undoubtedly typhoid fever (1 of them being fatal) and we have encountered 2 certificates of death of soldiers returned to the Adjutant-General's Office—1 of them from typhoid fever, in the other the cause not given—concerning whom we have found no sick report. In addition to the foregoing, it should be stated that although this regiment was not mustered out until December 16, 1898, we have seen no sick reports from it after September. The above tabular statement must therefore be regarded as an underestimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Second Virginia Volunteer Infantry as a member of the Third Brigade and Second Division may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Richmond, Va., from about May 10 to June 1; it was in the national camp, at Jacksonville, Fla., from June 3 to September 19, changing its site on the 14th of August; it left Jacksonville for home on the 19th of September, and was mustered out at Salem, Va., on the 16th of December, 1898, but returned no sick reports after September. The initial date of the first probable attack of typhoid fever was June 2, and of the first certain attack of typhoid fever was June 8. The regiment arrived at the national camp at Jacksonville, Fla., already infected with typhoid fever. Its medical history as given by the board covers a period of only four months and twenty-six days (from May 10 to September 30, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorder, 168; of so-called short malaria, etc., 88; of so-called long malaria, etc., 32; of probable typhoid fever, 15, and of certain typhoid fever, 105. Total attacks of probable typhoid fever (including long malaria, etc.), 152.

(c) Total deaths from typhoid fever, 17; total deaths from all diseases, 20; morbidity per cent of total prob-

able typhoid attacks, 11.18; of total certain typhoid attacks, 16.19; per cent of typhoid deaths to all deaths by disease, 85.

(d) The mean strength was 1,220. The per cent of typhoid morbidity to mean strength as to total probable typhoid attacks was 12.45, while the average for the brigade was 26.68; as to total certain typhoid attacks was 8.60, while the average for the brigade was 16.59. The number of typhoid deaths per 1,000 of mean strength was 13.93, while the average of the brigade was 23.32, and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and have obtained the following figures as to the Second Virginia:

Disease.	Individuals.	Average age.
Short intestinal disorders	107	24.2
Long intestinal disorders	7	23.1
Total intestinal disorders	114	24.1
Short malaria, etc.	61	23.0
Long malaria, etc.	26	24.5
Probable and certain typhoid attacks	97	22.5
Total probable and certain typhoid and long malaria.	123	22.9
Grand total of all above classes	298	23.4
Fifteen soldiers who died from typhoid fever.....		23.4

For comparison of these average-age figures with similar data relative to other regiments in this brigade and division we refer to the general tables treating of this subject at the end of the Second Division of the Seventh Army Corps. (See also similar tables relating to certain regiments of the Second Army Corps at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) It is only when we study the course of sickness in regimental organizations from the standpoint of individual companies that we can adequately appreciate the fact that the course of typhoid fever in the regiment is characterized by a series of company epidemics, each having more or less perfectly its own individual characteristics. This is especially true when we regard the exacerbations during the course and the termination of the company epidemics. These company epidemics are rarely synchronous. A glance at the graphic chart of this regiment amply illustrates the truth of this fact. Concerning it it is not necessary to enter further into details. Not only are these variations in the company epidemics considered as integral parts of the regimental organizations, but there is as a rule no striking similarity in the course of these company epidemics, even as to those companies grouped together by battalion organizations. These dissimilarities in the course of company epidemics in the Second Virginia

would appear on their face to be incompatible with the assumption of a common, simultaneous, or more or less continuously acting agency as the chief means of propagation of the epidemics.

(b) As in other regiments of the division, the epidemics in the companies of this regiment had frequent greater or less exacerbations in their course, and the intervals between these exacerbations were as a rule more or less closely coincident with the average period of incubation of typhoid fever. The grouping of the attacks as they occur in the foregoing tabular statement and in the graphic chart illustrates this point more or less clearly.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) Lieut. J. S. Wilson, assistant surgeon, U. S. Army (with the aid of the regimental surgeon and the commandant of the Second Division Hospital), prepared a diagram map of the first camp of this regiment at Jacksonville, giving the arrangement of the companies and specially marking the tents in the company lines where attacks of typhoid fever anterior to the 1st of September had developed. According to this diagram map, the arrangement of the camp of this regiment was peculiar. Two battalions were located in a field across a "shell road" west of the First North Carolina, the company tents being arranged in single lines, separated by company streets running east and west. The arrangement of the companies of these two battalions from north to south was as follows: D, A, L, and F; K, E, C, and G. The company kitchens and battalion sinks were located to the east, along the border of the "shell road" above mentioned. The direction of the prevalent winds as indicated on the diagram map was from the southeast. It is noteworthy that with the exception of three tents of these two battalions all of the tents affected were in the western half of the battalion camps, most remote from the sinks and mess tents. Another battalion was located in another field to the northwest of the former, the company tents being arranged in a single row here also, the company streets here running north and south, the kitchens and battalion sinks being to the north. The arrangement of the companies in this battalion from east to west was as follows: M, I, B, and H. The officers' tents and regimental headquarters were located in another field to the west of the two first battalions and to the south of the last battalion. It is noteworthy that all of the affected tents in Companies M, I, B, and H were located in the southern third of the battalion, or that part most remote from the mess tents and latrine. Reference to the general sketch map of the camp of the Second Division shows that Main street traversed the camp of this regiment, running from north to south, separating the two battalions occupying the east field from the general regimental headquarters to the line of officers' tents,

and that Seventh street crossed Main street at right angles and separated the regimental headquarters from the battalion composed of Companies M, I, B, and H. The northwest field above mentioned was bordered on the north by the street or "shell road" which formed at its eastern continuation a battalion street of the First Wisconsin, along which scavenger carts passed and splashed over en route. A surgeon of one of the regiments of this division states that scavenger carts also passed along the streets traversing the Second Virginia (Main street and Seventh street).

Reference is made to the movement of the scavenger carts here for the purpose of calling attention to the fact that the prevalent winds during dusty times would naturally carry the dust from Seventh street directly upon the tents forming the southern third of Companies M, I, B, and H, in which all of the typhoid fever of that battalion was spotted in Doctor Wilson's diagram. But dismissing this matter of the wind laden from roads which were possibly infected, we would recall attention to the striking freedom from infection, as already mentioned, of the eastern half of the battalion camps of the Second Virginia bordering the "shell road" separating these camps from the camps of the First North Carolina, although the prevalent winds blew directly from this "shell road" over upon the kitchens and mess tents of these two battalions. (For other incidents of possible transportation of infection by dust-laden winds, see remarks upon this subject in the histories of the First Wisconsin, Second New Jersey, Fourth Virginia, and Forty-ninth Iowa.)

(b) Company E, according to the captain commanding, was detached from the regiment on special service at the rifle range, 3 or 4 miles distant, from August 24 to September 30 (20'). This captain states: "Up to the time of the detail to the rifle range the company was one of the healthiest in the regiment. The company camp at this place [rifle range] was well located on a high piece of ground, but the ditch at the range, in which the men were obliged to stand all day in the hot sun turning and marking the targets, was covered over with a foot or more of filthy, stagnant water all the time. Up to this time our company was remarkably healthy, but the work in the ditch caused a number of cases of typhoid fever." Reference to the graphic chart shows that for more than fifty days prior to this detachment there was only one attack of typhoid fever in this company, namely, on the 16th of July. On the 24th of August, the day the company went to the rifle range, a series of attacks of typhoid fever began, which continued, with some interruptions, especially marked toward the end, until the date of the last case recorded, on the 21st of September. The above-quoted opinion of the commanding officer of the company, although positive, is therefore decidedly erroneous as to attributing the typhoid fever in his company to service at the rifle range, however unfavorable the conditions may

have been there for the maintenance of good health. We must admit that the infection of these first cases certainly began eight or ten days before the detachment of the company on this service.

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation of this disease from data obtained from two different sources, and we have found in the general averages a striking coincidence in the figures thus obtained.

(a) This regiment furnishes data from only one of these two sources—period of incubation, as deduced from length of intervals between attacks of diarrhea preceding typhoid fever, and the development of the typhoid-fever attack. The Second Virginia furnishes only one example of an attack of diarrhea preceding typhoid fever by an interval which we may fairly regard as measuring the average period of incubation. The length of this interval was nine days.

N. B.—For data bearing upon this point, and upon others closely related to it, see the tables of the Second Division, Seventh Army Corps, relative to this subject, and also similar tables for the Second Army Corps at Camp Meade.

FOURTH VIRGINIA VOLUNTEER INFANTRY.

Third Brigade, Second Division, Seventh Army Corps.

ABSTRACT OF SURGEON'S TESTIMONY BEFORE THE BOARD.

[Capt. W. L. Old, assistant surgeon, in charge.]

Richmond, Va.—The Fourth Virginia was the last one of the three Virginia regiments to be mustered in. Our companies were all mustered in about the same time, somewhere near the first week in May. The regiment had remained in Richmond for about three weeks. Two or three days after its muster in, the regiment moved to Jacksonville. There was an old well on the site of the regimental camp at Richmond, and before the companies were organized the men drank from that well; and before this well was closed up the men had a great deal of diarrhea and some dysentery. Measles occurred in that camp; and there was one death from cerebro-spinal meningitis. "I do not think we had any cases of typhoid fever at all in the hospital at Richmond, and we did not have much malaria there. Most of our sickness at that camp was that of measles and bowel troubles."

Jacksonville, Fla.—The regiment arrived here at Jacksonville the 5th of June and went into camp at first between the Second Virginia and the Forty-ninth Iowa at Springfield (a suburb of Jacksonville). We are now at the new camp site in a similar position relative to those two regiments. In the old camp site the Forty-ninth Iowa directly adjoined us across the street on the

north, and the Second Virginia was on the south. Our old camp site was somewhat contracted. We had not room enough on our flanks for anything. One company bordered the road on our south and the other was against the Forty-ninth Iowa.

Our water supply (that from the city of Jacksonville) was already installed when we arrived. Shacks for the vending of pies, soft drinks, etc., were located along the road, and all companies had free access to them and patronized them. Captain Old did not think that the water supply of his camp had ever been turned off temporarily for any purpose. He did not know of a time when the water would not flow when the taps were opened.

The men were living in several varieties of tents—conical. A wall tents, and dog tents—all mixed up in the same company rows. Thought the number of men in a conical tent would be about 18. The men at first had to sleep on the ground, but recently nearly all the tents have been floored.

There was a regiment in the rear. "I think it was the First Wisconsin, but I do not know, and their sinks backed up against ours." (Note by the board: The Fiftieth Iowa was in the rear, east of the Fourth Virginia.) "There was a big main ditch running between our camp and that of the regiment in the rear." The impression of the surgeon was that the water did not flow, but remained stagnant in this ditch. "We practically had no drainage at all there, but cleaned out the ditch as best we could." The nearest company mess tents were about 50 feet from the line of the battalion sinks.

The method of disposal of feces was that of the "tub system." Usually the tubs would be removed often enough. There was, however, a day now and then when they would not be removed, but they would be taken away the next day, and so it would go on for two or three days at a time. Overflowing of the tubs was not noticed. Although the tubs were not full to overflowing, they slopped over sometimes. But the soiling of the ground within the latrines by the men was not observed. I do not think there was any of this done. There was a good deal of soiled paper blowing around sometimes within the latrine houses, which were not floored; but it is not believed that this paper blew out over the encampment, for the police was very strict around there. "We had battalion sinks—not company sinks." Could not say how far the sinks were from the nearest company messes, but, roughly speaking, would say about 40 feet; that is, they were very near. (The board here endeavored to learn from Captain Old the course the scavenger wagons pursued after loading up from the latrines of the Fourth Virginia; but, either through the confusion of Captain Old's replies—his interrogation being made upon the first day he was in charge of the regiment—or through that of the stenographic report and numerous hiatuses in the latter, it

is impossible for the board to arrive at any very definite conclusion in this matter. The one certainty which can be derived is that these wagons did not pass along the southern flank of the Fourth Virginia. And it also seems pretty clear that for the scavenger wagons to reach the latrines both of the Fourth Virginia and of the Forty-ninth Iowa they passed along the street separating Company K, of the north battalion, from the company of the Forty-ninth Iowa on the extreme southern flank of that regiment. It is also clear that the sinks of the Forty-ninth Iowa were in a line with those of the Fourth Virginia. The following is a comment made by a member of the board during the cross-examination of Captain Old concerning this matter: "The Iowa regiment lies north of the Fourth Virginia, separated by the road along which the scavenger wagons passed to get to both regiments, Company K of the Fourth Virginia lying directly upon the south side of the road, while the prevailing winds were all blowing in the direction of the Forty-ninth Iowa."

Diarrhea has been pretty prevalent in the regiment. It is now the chief disease, and has been so ever since we have been here—not only in the old camp, but also in the new. We have had lots of cases which have not needed to be sent to the hospital. Captain Old was of the impression that Company K had been affected with typhoid fever more than any other company in the regiment. He knew that they lost two men from typhoid fever, one dying at the division hospital. He remarked that Company K came from Petersburg, a place of some 20,000 or 25,000 inhabitants. Nearly all of the men were town boys. The social status of the company he thought to be tiptop, but he did not like to make a comparison in that respect with the other companies. Two of the companies were from Richmond and four from Norfolk. "Our regiment is the 'tide-water regiment.' Their social standing is all right. The men of Company K appear to have more money than they receive from their pay, and they get lots of boxes from home—more of them I believe, than any other company. This was true while the regiment was in Richmond, and I am quite sure it is true since we came to Jacksonville." Captain Old could not say whether this company came to Jacksonville with typhoid fever. The Fourth Virginia has lost 6 men, 2 of them from Company K; Company I, the next company south of K, lost 1, and they had several cases of typhoid fever; Company F lost a man who came from near the middle of the camp, in the middle battalion. He could not locate the deaths in the tents accurately. There were more deaths occurring from typhoid fever shortly after arriving at Jacksonville than at the present time. Captain Old could not say whether or not there was any grouping of the typhoid attacks in tents. He did not think there had been any occurrence of typhoid since going into the new camp. He offered the remark, however, that "if we have a case of fever and it runs a couple of days we

send it the hospital." He had not heard of any of these cases sent to the hospital having developed into typhoid. He did not get the diagnosis from the hospital until he sent for it. "At the present time (about August 28) we have 33 men sick in quarters with malarial fever. They become sick with a chill." Questioned if he had any continued malarial fever, Captain Old replied: "I think two or three cases, which have run two or three days; diagnosis not yet made."

ABSTRACT OF COMMUNICATIONS FROM THE COMPANY COMMANDERS OF THE FOURTH VIRGINIA VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. H. H. Sheen, commanding Company A, stated substantially as follows: The arrangement of companies in battalions in the first camp at Jacksonville was K, C, I, D; F, M, H, G; A, L, B, E. In the second camp the arrangement was A, L, B, E; F, M, H, G; K, D, I, C. (The order and number of the battalions is not mentioned.) In response to a request for the grouping of men in their tents, the commanding officer stated it was impossible for him to give the information, for the following reasons: "We went to Jacksonville with 84 men and recruited to 105, then discharged 10 or 12, so that the occupants of the tents were constantly changing. Then we had four different styles of tents, from one man in a shelter tent to eighteen men in a conical tent. Moreover, we changed camp at Jacksonville four times."

This company was on guard at the rifle range for ten days in October (exact date not given).

"I lost no men from sickness, and can remember but two cases of typhoid fever in my company while at Jacksonville. My experience as regimental police officer proved to me that those companies were the healthiest whose officers rigidly inspected the kitchens and the sanitary conditions daily, and exacted rigid discipline.

"Our system of sinks in the Fourth Virginia was almost perfect, greatly checking the spread of typhoid."

Capt. Thomas J. Nottingham, commanding Company E, furnished a list of his men as they were grouped in tents at the first camp at Jacksonville, and stated substantially as follows: The grouping of the companies in battalions at the first camp at Jacksonville was as follows: First Battalion, Companies K, D, I, C; Second Battalion, Companies F, H, M, G; Third Battalion, Companies A, L, B, E. In the second camp there the arrangement was: Third Battalion, Companies C, I, D, K; Second Battalion, Companies G, H, M, F; First Battalion, Companies E, B, L, A.

Explanatory of the list of men grouped in tents, Captain Nottingham said: "The recruits that came in were put in tents to fill vacancies. At the second camp the men were located about the same as in the first camp. The tents were all in a single row and all faced one way in the second camp, on one side of the company street,

while in the first camp the tents were in a single row, two companies being upon opposite sides of the same company streets and facing each other."

This company was detailed on provost duty for ten days in the city of Jacksonville, about the middle of July, and at that time was quartered two squares from provost headquarters, on a very small but high plot of ground.

The original company of 84 men came from the city of Norfolk, Va. The recruits came almost entirely from towns and cities. The men were of medium intelligence, as a rule reckless, but could generally be held in check. The financial status was below the average.

My company had considerable typhoid fever, but we did not lose a man during our entire service. The location of the first camp seemed unhealthy. It would be flooded in some parts during rains. The hard drilling in the sun, together with the location of the camp, no doubt aided the development of typhoid fever.

Capt. M. C. Jackson, commanding Company K, stated substantially as follows: In the first camp at Jacksonville, Fla., from June 6 to August 13, my battalion, the First, was comprised of Companies C, I, D, and K.

This company was on provost duty at Pablo Beach, Fla., from August 9 to 27, inclusive. The men were from an urban population and above medium intelligence, were reasonably prudent, and their financial status was above the average.

From the low position of our company camp, when it rained the least bit hard the tents were flooded. If it had not been for the Pablo Beach trip, I think my company would have lost 20 men. I did lose 5 men by typhoid fever, and I believe that this fever came from the low ground of the camp. We were right in an old swamp, and my company was the lowest of all. The colonel did not let me move until two or three of my men had died. Other contributing causes may have been the consumption of lots of fruit, some of it over-ripe, and pies of all descriptions, sold at stands just outside our camp limits. Furthermore, our quota of ice per day, 50 pounds, was not nearly enough to keep our meat half a day. It is my opinion also that flies from the sinks carried the disease germs to the kitchens, the distance between them being too small.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

May.—(Camp Lee, Richmond, Va.) Mean strength averaged for twenty-two days: Officers, 43; enlisted men, 917; total, 960. No sick report summary.

Abstract of remarks by Charles R. Vance, major and surgeon:

Regiment organized at Richmond, Va. Went into camp near Richmond, May 9, and remained there during the organization of

the regiment, to May 31. Health of regiment very good, and the sanitary condition of the camp was fair.

June.—(Camp Lee, Richmond, Va., and Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 45; enlisted men, 979; total, 1,024. Admitted from command, 182; total to account for, 182. Of 166 completed cases, 106 returned to duty; 60 were sent to other hospitals. Remaining on sick report: In quarters, 16.

Abstract of remarks by Charles R. Vance, major and surgeon:

Regiment left Camp Lee, June 5, for Jacksonville. From June 1 to June 5 in camp at Camp Lee, Richmond, Va. From June 5 to June 7 en route for Jacksonville, Fla. From June 7 to end of month, regiment stationed at Camp Cuba Libre, Jacksonville, Fla.

Health of the camp very good. Sanitary condition good. One man, private, Company F, aged 21, died from cerebro-spinal meningitis, at Old Dominion Hospital, in Richmond, Va., June 7, 1898.

July.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,109; total, 1,155. Remaining on sick report from last month, 14; admitted from command, 294; total to account for, 308. Of 250 completed cases, 203 returned to duty; 1 discharged; 46 transferred to other hospitals. Remaining on sick report: In quarters, 58.

Abstract of remarks by Charles R. Vance, major and surgeon:

Regiment at Camp Cuba Libre during month of July. Prevailing diseases are acute gastro-enteritis and the various forms of malarial fever. The malaria is due to the low condition of the camp. The surface water can not be perfectly drained off.

August.—(Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 45; enlisted men, 1,199; total, 1,244. Remaining on sick report from last month, 59; admitted from command, 312; total to account for, 371. Of 328 completed cases, 221 were returned to duty; 107 were sent to other hospitals. Remaining on sick report: In quarters, 42.

Abstract of remarks by William L. Old, captain and assistant surgeon:

The prevailing diseases are the various forms of malarial fever, mostly the remittent type; acute diarrhea, with a few cases of dysentery.

On August 17 moved camp from Springfield (Jacksonville, Fla.) to the present location. This new camp site is well located, drainage good, and the sanitary condition of the camp is very good.

September.—(Camp Cuba Libre, Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 43; enlisted men, 1,157; total, 1,200. Remaining on sick report from last month, 41; admitted from command, 219; by transfer, 17; total to account for, 277. Of 235 completed cases, 118 returned to duty; 1 died; 1 was discharged for disability; 1 transferred to insane asylum; 114 transferred to other hospitals. Remaining on sick report: In quarters, 42.

Abstract of remarks by Charles R. Vance, major and surgeon:

Regiment in Camp Cuba Libre during the month of September. The health of the regiment is fair and the sanitary conditions of the camp are good. There was 1 death in the regiment, a private dying suddenly from rupture of the coronary artery. The prevailing diseases are various forms of malarial fever. Some typhoid, dysentery, and diarrhea.

October.—(Camp Cuba Libre, Jacksonville, Fla., and Savannah, Ga.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,048; total, 1,094. Remaining on sick report from last month, 42; admitted from command, 154; total to account for, 196. Of 182 completed cases, 115 returned to duty; 1 discharged; 66 sent to other hospitals. Remaining on sick report: In quarters, 14.

Abstract of remarks by Charles R. Vance, major and surgeon:

Regiment at Camp Cuba Libre from October 1 to 25. From October 25 to 27 en route for Savannah, Ga. From October 27 to November 1 regiment has been in camp near Savannah, Ga. The health of the regiment has been fair, the sanitary condition of the camp excellent.

The prevailing diseases were the various forms of malarial fever; some cases of typhoid fever, diarrhea, and catarrhal jaundice.

November.—(Camp Onward, Savannah, Ga.) Mean strength averaged for thirty days: Officers, 46; enlisted men, 1,017; total, 1,063. Remaining on sick report from last month, 14; admitted from command, 71; total to account for, 85. Of 70 completed cases, 48 returned to duty; 2 were discharged; and 20 were transferred to other hospitals. Remaining on sick report: In hospital, 9; in quarters, 6.

Abstract of remarks by Charles R. Vance, major and surgeon:

The health of the regiment has been very good. The Fourth Virginia has been in camp at Camp Onward, Savannah, Ga., during the month of November, 1898. The different forms of malaria and jaundice were found in the regiment.

December.—(Camp Onward, Savannah, Ga., and Camp Columbia, Cuba.) Mean strength averaged for thirty-one days: Officers, 46; enlisted men, 1,135; total, 1,181. Remaining on sick report from last month, 15; admitted from command, 74; total to account for, 89. Of 65 completed cases, 50 returned to duty and 15 were transferred to other hospitals. Remaining on sick report: In quarters, 24.

Abstract of remarks by Charles R. Vance, major and surgeon:

The Fourth Virginia has been in camp at Camp Onward, Savannah, Ga., from December 1 to 13, 1898. Camp is in good sanitary condition. Acute catarrhal jaundice and various forms of malaria were present to a small extent.

December 15 the regiment broke camp and marched on board the transport *Chester*, leaving Savannah, Ga., December 16, and reaching Havana December 21. The sanitary condition of the transport *Chester* was not good. Very little sickness during the voyage.

December 22 the regiment left the transport *Chester* and went into camp at Camp Columbia, Cuba, where the regiment is now in camp. The sanitary condition of the camp is good. Water has to be hauled to the camp in barrels. Wood is very scarce.

One private sick in regimental hospital. Three privates detailed to the Fourth Virginia regimental hospital on December 10 have been on duty as nurses.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FOURTH VIRGINIA VOLUNTEER INFANTRY.

Brief outline of the medical history.—This regiment assembled May 9, 1898, at Camp Lee, Richmond, Va., where it remained in camp until June 5, when it left by rail for Jacksonville, Fla. On June 7 the regiment reached Camp Cuba Libre, was assigned to the Third Brigade, Second Division of the Seventh Army Corps, and went into camp with the Second Virginia and Forty-ninth Iowa—the two other members of this brigade—in the suburb of Springfield, upon a site within the corporate limits of the city of Jacksonville.

It remained encamped on this site until about the 14th of August, when, with its brigade associates, it moved perhaps 2 miles northeast to new ground outside the city limits (see general sketch map of the Seventh Army Corps at Jacksonville, Fla., Vol. 2), where the regiment remained without further change until its departure by rail from Camp Cuba Libre, on the 25th of October, for Camp Onward, Savannah, Ga. The regiment was at Camp Onward from October 27 to December 15, when it boarded the transport *Chester* and sailed for Cuba on the 16th, reaching the port of Habana on the 21st and Camp Columbia, near Habana, on the 22d, where it was still encamped December 31, 1898. Although the regiment was not mustered out until April 27, 1899, at Savannah, Ga., this medical account ends on the last day of 1898.

The medical history thus covers a period of seven months and twenty-two days. Of this time, twenty-seven days were passed at its State camp; two days en route for Jacksonville, Fla.; from the 7th of June to the 25th of October, or one hundred and forty days, the regiment was in the national camp at Jacksonville, Fla., the first sixty-eight days of which on the original site within the city limits, the next seventy-two days on new ground outside the city limits; from October 27 to December 15, or forty-eight days, this command was at Camp Onward; and the last ten days of the month of December were spent in Camp Columbia, near Habana, Cuba.

The detailed history below shows very conclusively that the Fourth Virginia transported from the State camp at Richmond, Va., to the national camp at Jacksonville, Fla., the infection of typhoid fever.

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classifica-

tion, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the beginning of attacks were recorded as closely as they could be ascertained:

[Fourth Virginia Volunteer Infantry; mean strength, 1,274.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.	Total probable typhoid, including long malaria.	All other.
June	40	2	.....	42	38	3	1	10	14	1
July	37	3	1	41	102	13	3	17	33	2
August	35	9	1	45	72	11	3	44	58	.....
September	17	10	5	32	47	17	14	41	72	1
October	12	6	4	22	41	11	11	14	36	7
November	4	.....	.....	4	17	3	3	9	15	.....
December	4	.....	1	5	18	1	3	.....	4	2
Total	149	30	12	191	335	59	38	135	232	7

A rectification of the total number of so-called long malaria, etc., as given in the above summary table, by months, should be made by reducing the total of 59 to 58, thus requiring a corresponding reduction of the number of total probable typhoid attacks from 232 to 231.

The above tabulated deaths from disease, by months, were distributed among the companies of the regiment as follows:

	Company.												Staff.	Total.
	A.	B.	C.	D.	F.	G.	H.	I.	K.	L.	M.			
Typhoid .....	.....	1	1	1	4	2	2	1	4	1	3	1	21
Other diseases	2	.....	.....	.....	1	2	.....	1	1	.....	.....	.....	7
Total	2	1	1	1	5	4	2	2	5	1	3	1	28	

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid fever, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such other attacks.

Intestinal disorders in the Fourth Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Single short diarrhea	5	14	8	9	7	10	7	9	7	2	2	4	1	85
Two attacks short diarrhea	3	.....	1	1	.....	1	1	.....	1	1	.....	.....	.....	9
Short and long diarrhea	2	1	2	.....	3	2	.....	3	1	1	2	.....	.....	17
Single prolonged diarrhea	2	1	1	.....	.....	3	1	.....	3	1	.....	.....	.....	12
Total diarrhea	19	19	18	18	13	16	19	17	11	9	11	2	.....	191

Totals include diarrhea in malarial and typhoid combinations.

Combinations of continued or malarial fever in the Fourth Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Short malaria (uncombined)	23	12	19	5	12	17	14	25	15	22	21	25	1	211
Short malaria preceded by diarrhea	1	1	1	4	.....	.....	1	3	.....	.....	1	.....	1	13
Short malaria followed by diarrhea	2	.....	1	1	1	1	1	.....	1	.....	3	2	.....	13
Short malaria, diarrhea and short malaria .....	.....	.....	.....	.....	1	1	.....	.....	.....	1	.....	.....	.....	3
Two attacks short malaria	1	1	1	3	1	3	3	2	5	2	.....	1	.....	23
Short and long malaria .....	.....	1	1	.....	1	.....	1	.....	1	1	1	.....	.....	7
Long malaria (uncombined)	3	5	5	3	1	6	2	2	.....	4	2	7	1	41
Long malaria preceded by diarrhea	1	1	.....	.....	1	.....	1	.....	1	2	.....	1	.....	8
Long and short malaria	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Total short malaria	32	17	26	16	15	31	26	34	36	33	32	35	2	335
Total long malaria	5	7	7	3	2	7	3	3	1	8	3	9	1	59

Totals include malaria in typhoid combinations.

Combinations of typhoid fever in the Fourth Virginia.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined)	5	6	12	5	9	14	7	5	6	6	4	12	2	93
Probable typhoid (uncombined)	1	2	5	1	2	1	.....	5	2	4	1	1	2	27
Typhoid beginning in diarrhea	1	.....	1	1	.....	.....	.....	.....	1	.....	1	.....	.....	5
Probable typhoid beginning in diarrhea .....	.....	1	.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....	3
Typhoid preceded by diarrhea .....	.....	.....	.....	2	1	.....	2	2	.....	.....	1	.....	.....	8
Probable typhoid preceded by diarrhea .....	.....	1	1	.....	.....	1	1	.....	.....	.....	.....	.....	.....	4
Typhoid preceded by malaria	3	1	1	.....	4	2	1	4	4	1	2	.....	.....	23
Probable typhoid preceded by malaria .....	.....	.....	.....	.....	.....	.....	2	.....	1	1	.....	.....	.....	4
Typhoid followed by malaria .....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	2
Combinations of three diseases .....	.....	2	.....	.....	.....	.....	1	.....	.....	1	.....	.....	.....	4
Total certain typhoid	9	7	16	8	10	18	11	9	11	10	8	16	2	135
Total probable typhoid	1	4	6	2	2	1	1	8	2	6	2	1	2	38
Total probable and certain typhoid	10	11	22	10	12	19	12	17	13	16	10	17	4	173

The records of sickness in this regiment were found to be more or less incomplete and to some extent conflicting. By way of illustration, there were 38 names of soldiers of this regiment entered in the regimental sick reports as having been sent to the division hospital which were not found in the reports of the latter. Furthermore, the medical records relating to this regiment reveal 31 cases of so-called short malaria, etc., whose final disposition is not indicated. How many of these incomplete cases were really typhoid fever and should have been added to the total given in the above summary table it was of course impossible for us to estimate. That there were at least some, possibly many, we think, can not be reasonably questioned. Moreover, 2 fatal cases of typhoid fever have been encountered of which the death certificate in the Adjutant-General's Office was the only sick record found. The above tabular statement should, we think, be regarded as a conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Fourth Virginia Volunteer Infantry as a member of the Third Brigade and Second Division may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Richmond, Va., from about May 9 to June 5; it was in the national camp at Jacksonville, Fla., from June 7 to October 25, and changed camp site on August 14; it was in the national camp near Savannah, Ga., from October 27 to December 15, and in Camp Columbia, near Habana, Cuba, from the 21st to the 31st of December, 1898. It was mustered out April 27, 1899, at Savannah, Ga. The initial date of the first probable attack of typhoid fever was June 11, and of the first certain attack of typhoid fever was June 9. The regiment arrived in the national camp at Jacksonville, Fla., already infected with typhoid fever. Its medical history, as given by the board, covers a period of seven months and twenty-two days (from May 9 to December 31, 1898), and it is epitomized in the succeeding numerical data:

(b) Attacks of intestinal disorders, 191; of so-called short malaria, etc., 335; of so-called long malaria, etc., 58; of probable typhoid fever, 38, and of certain typhoid fever, 135. Total attacks of probable typhoid fever, including long malaria, etc., 231.

(c) Total deaths from typhoid fever, 21; total deaths from all diseases, 28; mortality per cent of total probable typhoid attacks, 9.09; of total certain typhoid attacks, 15.55; per cent of typhoid deaths to all deaths by disease, 75.

(d) The mean strength was 1,274. The per cent of typhoid morbidity to mean strength as to total probable typhoid attacks was 18.11, while the average for the brigade was 26.68; as to total certain typhoid attacks was 10.59, while the average for the brigade was 16.59. The number of typhoid deaths per 1,000 of mean strength was 16.48, while the average for the brigade was 23.32, and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Fourth Virginia:

Disease.	Individuals.	Average age.
Short intestinal disorders	89	25.6
Long intestinal disorders	17	22.6
Prolonged intestinal disorders	12	26.6
Total intestinal disorders	118	25.3
Short malaria, etc.	228	23.5
Long malaria, etc.	45	23.6
Probable and certain typhoid attacks	158	23.3
Total probable and certain typhoid and long malaria	203	23.4
Grand total of all above classes	549	23.8
Twenty-one soldiers who died from typhoid fever		23.4

For comparison of these average age figures with similar data relative to other regiments in this brigade and division we refer to the general table treating of this subject at the end of the Second Division of the Seventh Army Corps. (See also similar tables relating to certain regiments of the Second Army Corps at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) There is a conflict of testimony as to the arrangement of the companies in the regimental camps at Jacksonville. (Refer to the testimony of company commanders concerning this matter.) This dissimilarity in the course of the company epidemics in the Fourth Virginia would appear to be incompatible with the assumption of a common, simultaneous, and more or less constantly acting agency as the chief means of propagation of these company epidemics.

(b) As in other regiments of this division, epidemics in the companies of the Fourth Virginia showed frequent greater or less exacerbations in their course, and the intervals between these exacerbations were more or less coincident with the average period of incubation of typhoid fever.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) Company E was detached from the regiment on provost-guard duty in the city of Jacksonville from July 20 to 28; and at that time "was quartered two squares from the provost-guard headquarters on a very small but high plot of ground." Reference to the graphic chart shows that this company had no serious sickness previous to, during, or subsequent to this detached service, until the 16th of August. By comparing the record of sickness of this company with similar records of other companies we can but conclude that the result of this detached service may have been to defer the commencement of infection of the company to a later date than it otherwise might have been had the company remained with its regiment.

Company K was detached from the regiment from the 9th to the 27th of August, inclusive, on provost duty at Pablo Beach, Fla. Reference to the graphic chart shows that previous to this detachment the company had had a number of scattered cases of typhoid fever; and that from the 9th to the 24th of August there were no attacks of this disease; on the 25th and 29th of August and the 1st of September there were, respectively, three attacks of typhoid fever. These three latter attacks we may infer received their infection during the time of the detached service of the company at Pablo Beach. The previously mentioned cessation of serious attacks during the time of this service can hardly be attributed to any other circumstance

than the cessation of infection previous to the date of detachment. It would therefore appear that it would be misleading to assume in this case that the detached service of the company could have exercised any very great influence upon the course of the epidemic. Company B was detached from the regiment on provost-guard duty in the city of Jacksonville from August 30 to September 11. Reference to the graphic chart shows that there was no attack of typhoid fever in this company between August 15 and September 12, inclusive; that commencing on the 14th of September an epidemic in this company developed and continued for over thirty days. We may therefore readily infer that the infection of this epidemic must have been received during the time of its detached service. Company L was detached from the regiment on provost-guard duty on the 18th of September and was still out on that special service on the 27th. Reference to the graphic chart shows that this company had no attack of typhoid fever between the 1st and 29th of September, inclusive. There had been two or three groups of attacks of typhoid fever anterior to the commencement of this detached service, but the infection in the company seems to have died out by the time the detached service began. The graphic chart shows a group of three attacks of typhoid commencing within three days after the return of the company to the regimental camp. We may fairly infer that this latter group of cases received its infection during the time of the detached service. In view of all these facts it does not seem reasonable to assume that the detached service exercised any beneficial effect upon the course of the epidemic.

SPECIAL CHARACTERISTICS OF CERTAIN COMPANY EPIDEMICS, AS EXHIBITED BY THE GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN TENTS, VIEWED FROM THE STAND-POINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) We have endeavored to ascertain the names of soldiers as they were grouped in their company tents during the period of the encampment at Jacksonville in order to examine into this important question. To this end we have requested such data from two different sources; namely, from the regimental surgeons and commanding officers of companies. The only full information upon this point which we have received concerning this regiment was obtained from the commanding officer of Company E as to his own men. By comparison of the squad groups of men occupying their respective tents in this company with regard to sickness which we obtained from other sources we have been enabled to plot in their respective tents the attacks of typhoid fever in this company. These plotted cases show a marked limitation of the attacks to certain groups of men in tents. The squad groups of the sick as plotted in their respective tents would seem to be

incompatible with the assumption that the chief factor in the propagation of typhoid fever through this company may have been some agency whose influence was common and pretty constantly acting upon the whole command; on the contrary, they would appear to suggest a mode of disseminating infection which more effectively reached and acted upon certain limited groups or squads of men, while it passed by others, which would be entirely compatible with a dominating tent, squad, or comrade infection.

(b) A further indication of the existence and active influence of a tent, squad, or comrade infection in this command is the following result of a careful analysis we have made of the records of sickness in Company E of this regiment in connection with the grouping of infected men in their respective tents and the average time elapsing between successive attacks in the same tent or in adjoining tents. In this company there were 10 attacks of typhoid fever plotted, of which there were 8, or 80 per cent, whose initial dates were found to be separated by periods corresponding more or less closely with the average period of incubation of typhoid fever. (For more details concerning this matter we refer to the tables showing the number and per cent of "connectable" attacks of typhoid fever in tents as deduced from the captains' tent lists of the Second Division, Seventh Army Corps. For comparison of similar data furnished by the Second Army Corps we refer to a similar table in that corps.)

ESTIMATION OF THE AVERAGE LENGTH OF THE PERIOD OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation in this disease from data obtained from two different sources, and we have found a striking coincidence in the figures thus obtained:

(a) Period of incubation as deduced from the length of intervals between "connectable" attacks of typhoid fever occurring in the same or in adjoining tents. In 10 attacks plotted we have obtained 6 intervals from which the average period of incubation may be calculated, and we have found in these 6 cases that the interval averaged ten and six-tenths days.

(b) Period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid fever attacks. The Fourth Virginia furnishes 3 examples of such combinations in individuals, the attacks being separated by intervals which could be fairly regarded as measuring the period of incubation. The average length of the intervals in these 3 cases was eleven and six-tenths days.

N. B.—For similar data concerning other regiments of this division see tables of the Second Division, Seventh Army Corps, relative to this subject, and similar tables of the Second Army Corps.

FORTY-NINTH IOWA VOLUNTEER INFANTRY.

Third Brigade, Second Division, Seventh Army Corps.

ABSTRACT OF SURGEON'S TESTIMONY BEFORE THE BOARD.

[Lieut. E. L. Martindale, second assistant surgeon and acting regimental surgeon.]

Des Moines, Iowa.—The surgeon of the regiment, Major Clarke, is stationed at the Second Division Hospital. He has been detached from the regiment ever since we have been at Jacksonville. Lieutenant Martindale has been on duty with the regiment during the whole time of its service up to the present (August 29). The regiment was mustered in at Des Moines, and camped upon the state fair grounds. The regiment used the fair ground latrines, which consisted of the dry-earth system. They were furnished with the city water supply. There was an artesian well on the fair grounds. There was no serious sickness at the State encampment, there being 2 cases of pneumonia, some measles, and mumps. The regiment assembled at Des Moines about April 26, and remained there until the 11th of June.

Jacksonville, Fla.—The regiment arrived at Jacksonville June 14, and went into camp just north of the Fourth Virginia. We found the water supply (that of the city of Jacksonville) already installed, and the latrines already prepared. We are supplied in the second camp with artesian water from a point somewhere near the camp.

The excrement in the first camp was disposed of by means of "tubs," consisting of half barrels with rope handles. These tubs sometimes overflowed, and the contents slopped out. This applies to the first encampment (Jacksonville). We are not using them at present (in the new encampment), but are employing pits. The tubs were abandoned when we moved to the new location; this being rendered possible by our going outside of the city limits. We are now near Panama Park, and are brigaded with the Second and Fourth Virginia regiments, being placed north and west of them. The Fourth Virginia is still using the tubs, but I insisted on having pits, for I believed they would be better. These pits are covered with dirt and lime three times a day, and when the contents reach within 2 feet of the surface of the ground, we abandon them and dig new pits. The system of covering the individual feces immediately upon voiding is not practised, but I think it is a good idea. Our latrines are now located 200 yards from the kitchens. The latrines of the Virginia regiments are not near us at any place.

In the first camp at Jacksonville the company messes and kitchens were located at the rear end (east) of the company streets, and the latrines still farther to the rear, but separated from the kitchens by only a very short distance. Just to the rear (east) of the line of battalion sinks ran a ditch north and south separating the

encampment of the Forty-ninth Iowa from that of the Fourth Illinois. Into this ditch flowed the surface or rain water of the encampments just mentioned. Scavenger wagons, in order to reach the latrines for the removal of their contents, were obliged to go along the company streets, and between the latrines and the kitchens, passing not more than 12 to 15 feet from the latter. It was often observed—and I myself personally witnessed it—that while passing along in this proximity to the kitchens the contents of the latrine tubs would be splashed over and spilled upon the ground. Replying to a question as to why the latrines were not placed upon the other side of the ditch in order to increase the distance from the kitchens, the surgeon stated that it was impossible, for the reason that another regiment (Fourth Illinois) occupied the ground immediately upon the other side of the ditch. The surgeon had frequently protested against this state of affairs, but it was continued for a month notwithstanding; and during most of this time the weather was dry and the dust blew around. The latrines and kitchens were located on the east side of the encampment. This state of affairs did not continue after the typhoid fever began to appear, for the latrines were by that time removed farther east of us into a vacant field. (This field was made vacant by the removal of the Fourth Illinois, above mentioned, which was transferred to the Third Division of the Seventh Army Corps.) I think this change of the latrines was made about a week after the captain of Company F came down with the disease. It should be noted that after the scavenger wagons passed along to the rear they did not return through the regiment, but left it, passing along at the rear ends of the company streets. The closet paper did not blow around very much over the ground, as the prevalent winds were in the opposite direction, away from the sinks. The latrines were moved about six weeks before we left that camp; that would be about July 3. After their removal the scavenger wagons did not continue to come into the immediate rear of the mess tents.

In our first camp (Jacksonville) Company K was located along the ditch that carried the sewage, or rather the surface water, from the Virginia camps. Water was standing in that ditch all of the time 4 or 5 inches deep. We put lime, etc., into it, endeavoring to disinfect. Company K was located along (the south side) and parallel to this ditch, its kitchen being located along the border. To the rear of the kitchen, and beyond the kitchen sink, battalion latrine and bath house, was another ditch running at right angles, which joined the former. The other ditch drained the Fiftieth Iowa and Fourth Virginia camps, carrying off bath-house water. (Note by the board: This statement seems to be somewhat incorrect, as appears by a large map of this regiment furnished by Lieutenant Martindale, in which the company tents are platted with reference to two ditches represented in the plat, which cross each

other at right angles near a battalion latrine and bath house, located to the rear of the kitchen of Company K. In this plat Company K is placed on and parallel to the south border of a ditch named in the plat, "Drainage ditch, draining swamps northwest of the camp, running north of brigade headquarters." This ditch follows an easterly course, passing to the north of Company K's kitchen, and, going farther eastward, between the bath house and latrine of the battalion to which Company K belongs. Just east of this bath house and sink, this easterly running ditch is crossed at right angles by another ditch running north and south. In the plat along the southern end of the latter ditch there is the descriptive phrase, "Ditch draining Fiftieth Iowa and Fourth Virginia camps, carrying off bath-house water;" and along the northern end of the same ditch is the descriptive phrase, "Ditch draining Forty-ninth Iowa and Fourth Illinois." It is evident, therefore, that the water in the ditch passing along Company K was simply that which drained the swamp above mentioned, and not that which came from the Virginia regiments.)

The Forty-ninth Iowa have a variety of tents; some conical, some wall tents, and some "dog" tents. The men have been much crowded until recently, when we received an issue of 50 tents. Nine to 12 occupied the wall tents as a rule, and the men were packed together in them, coming into close contact with each other. Now (since the new issue), I think, 6 is about the number these tents contain. They are the ordinary size wall tents, 9 by 9 feet. The colonel commanding the regiment has several times asked for more tentage. The men slept upon the ground until recently. During the last month, the men have been buying lumber for themselves and raising their floors from the ground, but the Government is at present furnishing the lumber for that purpose.

Lieutenant Martindale could not say what was the origin of typhoid fever in Company K. Companies K and B have been detached from the regiment upon patrol duty. Company B being off on such duty at the time we moved to our present camp, about four weeks ago. Company K was on patrol duty down town (Jacksonville) perhaps four weeks after we arrived here in camp. It was remarked that the health of the men on patrol duty seemed to be better during that service than when in camp.

The cases of typhoid did not begin to appear in the regiment rapidly in great numbers, but gradually. This was one of the regiments that was very healthy for a while, the healthiest here." The first case of continued fever must have occurred at least five weeks after our arrival here. Typhoid fever appeared first in Company F, but it has not been particularly marked in this company, nor confined to any one company, but scattered all through the regiment. Some companies have had more of this fever than others. Companies A and K

have had more cases, and Company M has probably not had over 3. The latter company was stationed at the rifle range for several weeks after it came here, and returned to camp about three weeks ago. The appearance of typhoid in Company M was since their return from the rifle range. One case, however, made its appearance at the rifle range, four or five days after they were sent there. This company was at the rifle range quite four weeks. They were supplied while there with the city water, hauled in barrels. I can not remember the kind of sickness Company M had while at the rifle range; but it is our healthiest company. The rifle range is located outside of the city limits, and I believe the disposal of fecal matter there was by means of pits. Company A was on provost duty in the country back of the camp, toward Panama Park, along the river bank. The captain admitted that he allowed his men to drink surface water from the pumps and wells around wherever they could find water. It had been the healthiest company previous to and during this detached service, but about two weeks after their return to camp they commenced to come down with typhoid fever. We are now having very little malaria—the city physicians tell us all our fevers are malaria. Responding to a question asking the number of deaths in the regiment, Lieutenant Martindale replied that he believed there were 4 in all, and all just recently. We did not have a death until two or three weeks ago. There are 71 or 72 men in the hospital to-day (August 29); am unable to say how many of these were typhoid, think most of them were. Most of the cases of typhoid have occurred since we have been in our new camp, and a week or so before. During the past week they have not been occurring with frequency.

When questioned as to whether typhoid fever cases were grouped more or less in tents, Lieutenant Martindale declared that he knew one tent in which 5 cases of typhoid had occurred, and thought that this was in Company A. Three cases of typhoid have occurred among the officers, and one of them died—a lieutenant of Company G. The other cases were the chaplain, who had visited to some extent in the tents of the sick, and a captain of Company F, whose was the first case diagnosed as typhoid fever in the regiment. Company F was the one located nearest to the Fourth Virginia, and the latter were having lots of typhoid fever when we came there.

The two companies which have had a great deal of typhoid are from Dubuque and Toledo. They were not the crack companies from a social standpoint, but were composed of men mostly from the middle class. There were no companies overwhelmed with boxes of edibles from home. There is no company in the regiment which has been free from disease.

The fevers have increased in this regiment in the last few days. We had a great deal of intestinal disorder in the regiment when we first came here. The latter

continued to decrease during the whole time of our stay in the first encampment, and when we moved our site there was no apparent effect in this regard. At the present time we have a small amount of intestinal trouble.

We do not permit the use of milk at all. On Sundays the men were generally given passes, and they could then visit the city.

ABSTRACT OF COMMUNICATIONS FROM COMPANY COMMANDERS OF THE FORTY-NINTH IOWA VOLUNTEER INFANTRY.

Jacksonville, Fla.—Capt. C. W. Cotton, commanding Company B, stated substantially as follows: The second order of company letters grouped in battalions is: First Battalion, F, H, K, C; Second Battalion, D, G, B, E; Third Battalion, L, I, A, M.

This company was on provost duty in Jacksonville from August 12 to 22. The majority of the men comprising this company were from an urban population. They were reasonably prudent as to conduct affecting health, and their financial status was about the average. I think my men stood at an average as regards sickness.

Capt. F. B. Roicene, commanding Company D, furnished a list of his men grouped in their tents, and stated substantially as follows: Companies F, H, K, and C comprised the First Battalion; D, G, B, and E the Second Battalion, and L, A, I, and M comprised the Third Battalion.

Company D was on patrol duty in the rural district in the neighborhood of the camp from August 6 to 13. The company came from a rural district. The intelligence of the men was medium. They were reasonably prudent in personal conduct and habits affecting health, and their financial status was about the average. This company suffered less from sickness than most of the other companies of the regiment, but I can not give any cause for the difference. We gave great attention to sanitary matters, such as methods of cooking, policing quarters, etc. I believe we were the first to institute the boiling of drinking water for the use of the men.

The men were inclined to sit and stand about quarters in the evening with only undershirts and trousers on. Watchfulness had to be exercised in order to have all the men properly clothed. I believe this is an important item which was overlooked by most of us who were unacquainted with the differences between the habits of life in northern and southern climates.

Capt. Albert G. Stewart, commanding Company I, stated substantially as follows: At no time were the men of this company for any considerable length of time in the same tents. The tentage originally furnished on going into camp at Jacksonville was of different sizes and quite inadequate. It became more and more inadequate as the numbers of the company increased from 62 enlisted men on reaching Jackson-

ville June 14 to 104 on August 1. Upon arrival here we had for the use of the men four old rotten 10 by 12 so-called "river" or "flood" tents and six wall tents 9 by 9. By August 1 we had in addition four common tents and a number of shelter tents, which latter were necessarily to some extent used in the company street in order to accommodate the men who could not find sufficient room in the tents forming the regular company lines. This shortage of tents continued until August 19, when the regiment was moved from its first camp to another site, where it remained until October 25. On this new ground the tents were arranged in the same order as in the first camp; that is, on one side of the company street only. The numbers of the men of the company had been so diminished by sickness that there was now plenty of room. The groups of men in the tents were frequently changed in order to accommodate those sick in quarters and to endeavor to distribute the remaining men with some degree of evenness among the more habitable tents. This explains why the grouping by tents, as asked for by the board, can not be given.

The companies in our battalion were arranged in the first camp at Jacksonville as follows: Third Battalion, M, A, I, and L.

This company was not on any detached service.

The company was from a rural population; that is to say, from towns and villages of small size. The intelligence of the enlisted men was above the average. The men were, with few exceptions, prudent as to their habits and personal conduct affecting health, and their financial status was about the average for young western men.

I think my company suffered more fatalities from the fever than did other companies in the regiment. In my opinion, this was due to three causes: First, from June 14 to August 19 we had no detached service, but kept on the same small tract of ground without change or intermission; second, the battalion sink was, owing to the limited space available for the camp, less than 50 feet from our cook shanty and a little farther from the company mess; third, owing to a slight depression in the ground, the company street, although as perfectly ditched as possible, could not be drained as thoroughly as most of the other company streets.

Capt. Peter W. M. Roberts, commanding Company K, stated substantially as follows: In the first camp at Jacksonville the order of company letters was as follows: From south to north, First Battalion, Companies F, K, H, and C; Second Battalion, Companies D, G, B, and E; Third Battalion, Companies L, I, A, and M. Note that at the second Jacksonville camp Companies H and K change places. Company K was detailed on provost duty in the city of Jacksonville from the 20th of June to the 2d of July, at which time it returned to camp. It was the company with its original strength that was on the above detail, the 44 recruits of the com-

pany being left behind in camp with the other companies of the regiment.

This company is chiefly from a rural population. The intelligence of the men is medium and they were reasonably prudent as to conduct and habits affecting health. The financial status was about the average.

This company suffered from the fever about the same as did the others of the regiment. In my opinion, the infection occurred in the first camp at Jacksonville, which was very low, wet, and damp, and was very close to other regiments.

Capt. E. C. Johnson, commanding Company M, stated substantially as follows: The men who composed the squads in the tents were so frequently changed that it would take a long time and a large amount of work to go back over my records for that purpose.

The order of companies, which was the same throughout the entire service, from the right to the left was: First Battalion, Companies F, H, K, and C; Second Battalion, D, G, B, and E; Third Battalion, L, I, A, and M.

The detached service of Company M was as follows: (1) Detached duty at rifle range, near Jacksonville, Fla. (no date given); while there camped near low and marshy ground. (2) By detachments, on patrol duty September 1 to 10, inclusive, but during this time camped with the regiment; "three hours on, six hours off, for each detachment—night work." (3) Detached again on duty at the rifle range, September 18 to October 25, inclusive. Camped near low marshy ground, as before. Hard work there in the sun making targets and in the pits, marking, etc.

Company M was composed as follows: Thirty-five (about 32 per cent) farmers—of these, 13 were not sick at all during thirteen months, 6 were slightly sick in quarters only, 4 were sick in the regimental hospital only, and 12 were sick in the division or general hospital; 40 (about 36 per cent) laborers—of these, 18 were not sick at all during thirteen months, 6 were slightly sick in quarters only, 7 were sick in the regimental hospital only, 9 were sick in the division or general hospital; 12 (about 11 per cent) mechanics—of these, 6 were not sick at all during thirteen months, none were sick in quarters, 1 was sick in regimental hospital only, and 5 were sick in the division or general hospital; 9 (about 8 per cent) mercantile—of these, 6 were not sick at all during thirteen months, 2 were slightly sick in quarters only, 1 was sick in regimental hospital only, none were sick in the division or general hospital; 5 officers (about 4 per cent)—4 of these were not sick at all in thirteen months, none sick in quarters, none sick in regimental hospital, 1 sick in division or general hospital; 6 students (about 5 per cent)—of these, 5 were not sick at all during thirteen months, none were sick in quarters, none sick in regimental hospital, 1 sick in division or general hospital; 2 teachers (about 2 per cent)—of these, 1 was not sick at all in the thirteen

months, 1 was slightly sick in quarters, none was sick in the regimental hospital, none was sick in the division or general hospital; total, 109. Of these, 53 were not sick at all in the thirteen months, 15 were slightly sick in quarters, 13 were sick in the regimental hospital only, 28 were sick in the division or general hospital. This is during a period of twelve and one-half months, from the 26th of April, 1898, to the 13th of May, 1899.

The average intelligence of the men is high. They were generally reckless as to care of themselves, but this was corrected by discipline. Their financial status was about the average. Never during the service of the company did I have less than 86 men fit for duty, even when other companies of the regiment could show but 6 to 30 fit for duty. This company lost 2 by death; 1 from typhoid, and 1 from enteritis.

I attribute the absence of sickness in my company to the following reasons: (1) Enforced activity in daytime and quiet at night, giving malaria no chance from inactivity or night exposure; (2) keeping men in camp at night, giving them little or no chance for exposure or abuse; (3) the possession of a first-class cook; (4) a close inspection of rations and meals before serving, and watchfulness of the sanitary conditions; (5) a sufficient knowledge of medicine by the captain (myself) and the first lieutenant, who was a junior medical student (we were both brought up in the office of a regular physician). We watched very closely the conditions of the men.

My personal observation has been, while in the service, that the disease was caused by exposure, by neglect of person, by abuse of person, by poor preparation of food, by contagion, as in typhoid fever; and was spread by flies from closets to tables, and by neglect of discrimination between attacks of typhoid and malaria and by delay in applying active measures of prevention.

ABSTRACT OF INDORSEMENTS UPON THE REGIMENTAL MONTHLY SICK REPORTS.

June.—(Camp McKinley, Des Moines, Iowa.) Mean strength averaged for twenty-eight days: Officers, 50; enlisted men, 886; total, 936. Admitted from command, 85; total to account for, 85. Of 73 completed cases, 58 returned to duty; 15 transferred to other hospitals. Remaining sick in quarters, 12.

Abstract of remarks by E. L. Martindale, first assistant surgeon, in charge:

* * * Since coming to Jacksonville, Fla., there have been many cases of stomach and bowel trouble, due, I believe, to change of climate. * * * Mustered in June 2, 1898. Left Des Moines, Iowa, June 11; en route for Jacksonville, Fla., until June 14. Distance traveled, about 1,800 miles. In camp at Cuba Libre to date.

July.—(Jacksonville, Fla.) Mean strength averaged for thirty-one days: Officers, 50; enlisted men, 1,241; total, 1,291. Remaining from last month, 10; admitted from command, 75; total to account for, 85. Of 67 completed cases, 44 returned to duty; 23 transferred

to other hospitals. Remaining on sick report in quarters, 18.

Abstract of remarks by Acting Surg. E. L. Martindale:

Have been numerous cases of malaria, and some of a very severe type. Probably due to low, damp ground and the extreme hot weather. The measures used for their prevention were ditching the camp and draining off surface water.

August.—(Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 49; enlisted men, 1,276; total, 1,325. Remaining from last month, 12; admitted from command, 232; total to account for, 244. Of 172 completed cases, 84 returned to duty; 88 transferred to other hospitals. Remaining on sick report in quarters, 72.

Abstract of remarks by Acting Surg. E. L. Martindale:

Typhoid fever during the last two or three weeks has become very common. The measures adopted to prevent it are as follows: The doing away with the tubs for the reception of night soil. Also have moved the camp $2\frac{1}{2}$ miles to a higher and better location, where there is more room between the different companies of this regiment and also more space between regiments. The deposits in the pits are covered frequently each day, so that there will be no chance for flies to carry the disease (typhoid germ).

Lieut. Guy Kellogg, who died August 31, took sick while staying down town and died while under treatment by some city (civilian) doctor, who called the case malarial fever. An autopsy held by Major Clark, First Lieutenant Hamilton, and myself proved it to be a case of typhoid fever without a doubt. The vendors of pies and cakes were prohibited from visiting the grounds. Also no stands were allowed in the grounds for the sale of fruit and soft drinks.

September.—(Jacksonville, Fla.) Mean strength averaged for thirty days: Officers, 48; enlisted men, 1,257; total, 1,305. Remaining from last month, 61; admitted from command, 389; total to account for, 450. Of 450 completed cases, 172 returned to duty; 10 died; 188 transferred to other hospitals; 90 otherwise disposed of. Remaining on sick report in quarters, 84.

Abstract of remarks by J. Fred Clarke, surgeon in charge:

The command is passing through an epidemic of typhoid fever. The disease was probably brought to Camp Cuba Libre by Virginia troops from Richmond and spread through the camp by the flies carrying the germs from the sinks (tubs) to the food. Screening the company kitchens and the use of the pit system of sinks have been advised; washing all blankets, burning all bedding, and cleaning thoroughly with carbolic acid have also been advised.

October.—(Jacksonville, Fla., and Savannah, Ga.) Mean strength averaged for thirty days: Officers, 48; enlisted men, 1,226; total, 1,274. Remaining from last month, 84; admitted from command, 217; total to account for, 301. Of 280 completed cases, 101 returned to duty; 16 died; 163 transferred to other hospitals. Remaining on sick report in quarters, 21.

Abstract of remarks by E. L. Martindale, first lieutenant and assistant surgeon:

Regiment left Camp Cuba Libre October 25 at 9 p. m. and arrived at Savannah, Ga., October 26 at 1.30 p. m. Regiment accompanied by Lieut. John Hamilton, assistant surgeon in charge.

November.—(Savannah, Ga.) Mean strength averaged for 30 days: Officers, 48; enlisted men, 1,206; total, 1,254. Remaining from last month, 21; admitted from command, 131; from other sources, 1; total to account for, 153. Of 108 completed cases, 79 returned to duty; 1 died; transferred to other hospitals, 28. Remaining on sick report in hospital, 12; in quarters, 32.

Abstract of remarks by E. L. Martindale, first assistant surgeon in charge:

The prevailing diseases were stomach and bowel trouble, including typhoid fever and including gastric disturbances (we include also acute catarrhal jaundice).

Two autopsies were held. One was on a man who had been sick in the hospital six or seven days without fever symptoms. An ulcerated condition of the entire colon was found, with hemorrhage into the abdominal cavity in several places; also general peritonitis, resulting from infection from the bowels. The other was upon a negro teamster who had been discharged as a civilian attaché, but still remained at the corral. Two ulcers in the ileum; through the base of one perforation had taken place. General peritonitis had resulted. Death was sudden and without warning, when the man was at stool.

December.—(Camp Columbia, Habana, Cuba.) Mean strength averaged for thirty-one days: Officers, 44; enlisted men, 1,179; total, 1,223. Remaining from last month, 44; admissions from command, 110; from other sources, 1; total to account for, 155. Of 151 completed cases, 144 returned to duty; 6 transferred to other hospitals; 1 otherwise disposed of. Remaining on sick report in hospital 9; in quarters, 25.

Abstract of remarks by Lieut. E. L. Martindale, assistant surgeon in charge:

The regiment left Camp Onward, Savannah, Ga., on board the steamship *Minnewaska*, December 19, 12.06 p. m., entering Habana Harbor December 21, 9 p. m. Left transport for Camp Columbia December 23 at about 2 p. m. The regiment was accompanied by first assistant surgeon in charge, E. L. Martindale; First Asst. Surg. John Hamilton, and Acting Asst. Surg. Vernon J. Hooper.

CONSIDERATION BY THE BOARD OF TYPHOID FEVER IN THE FORTY-NINTH IOWA VOLUNTEER INFANTRY.

Brief outline of the medical history.—This regiment assembled at the State encampment in the State fair grounds, about $2\frac{1}{2}$ miles from Des Moines, Iowa, about the 26th of April, 1898, and remained there until the 11th of June. On the latter date it started by rail for the national encampment at Jacksonville, Fla., and was en route three days. On the 14th of June the regiment reached Camp Cuba Libre, was assigned to the Third Brigade, Second Division of the Seventh Army Corps, and went into camp with the Second and Fourth Virginia—the two other members of this brigade—on a camp site located in the suburb of Springfield, within the corporate limits of the city of Jacksonville. It remained upon this camp site until the 14th of August (just two months), when, with the other regiments of this brigade, it marched a mile or two away and pitched camp upon new ground without the corporate limits of the city, where it remained until the regiment left Camp Cuba Libre October 25 for Camp Onward, near

Savannah, Ga. It is worthy of remark here that when the Forty-ninth Iowa abandoned its first camp site within the city limits on August 14, it also abandoned the disposal of excrement, etc., by the "tub system," and thereafter employed in its stead the old familiar method of "dug pits." But we will recur to this matter later. After removing to Camp Onward the regiment remained there until the 19th of December, when it boarded the transport *Minnewaska* en route for Habana, Cuba, that port being reached in the night of the 21st of that month. On the 23d of December the regiment disembarked and went to Camp Columbia, near Marianao, Cuba, where it was at the end of December. On the 31st of December, 1898, the medical history by the board terminated, but the Forty-ninth Iowa continued in the service of the United States until it was mustered out May 13, 1899, at Savannah, Ga.

This medical history therefore extends eight months and five days after the date of assembly of the regiment in its State encampment. Of this time, forty-six days were spent at the State encampment; the succeeding journey by rail during the hot season from Des Moines, Iowa, to Jacksonville, Fla., lasted three days; the regiment was at Camp Cuba Libre from June 14 to October 25—that is, one hundred and thirty-three days—during almost the whole of the summer and more than half of the autumn, for the first two months within the city limits and using the "tub system" for disposal of feces, for the next seventy-two days without the city limits and employing for the removal of waste the old familiar method of "dug pits." More than three-fourths of the typhoid fever in this regiment developed in Camp Cuba Libre.

Whether the Forty-ninth Iowa brought with it to the national encampment the infection of typhoid fever is somewhat doubtful, although it is very certain that it did not begin to be seriously affected until a month after reaching Jacksonville, notwithstanding the fact that at least 2 suspicious seizures occurred within four days after arriving there and the fact that these were followed during the month by the appearance from time to time of 8 febrile cases of more or less indefinite character and seemingly short course. It may be worthy of remark in this connection that the Fiftieth Iowa, leaving the State camp and arriving at Jacksonville a few days earlier than did the Forty-ninth Iowa, probably was not already infected at the date of departure from the State camp. (See the history of this regiment.) On the other hand, the Fifty-second Iowa (which joined the Third Brigade, Second Division of the Third Army Corps, at Chickamauga Park, Ga., on the 31st of May, arriving from the State camp at Des Moines) developed its first case of probable typhoid not later than June 8. (See history of that regiment.)

Development of typhoid fever and related sickness.—The following is a statement, arranged in tabular form for easier and more rapid examination and classification, of fevers (including typhoid) and intestinal disorders which have been regarded by the board as essentially

involved in a just estimation of the prevalence of typhoid fever. In all cases the dates of the commencement of attacks were recorded as closely as they could be ascertained:

[Forty-ninth Iowa Volunteer Infantry; mean strength, 1,236.]

Month.	Intestinal disorders.				Febrile attacks, malaria, etc.		Typhoid attacks.		Total typhoid probable, including long malaria.	Deaths from disease.	
	Short, 1 to 4 days.	Long, 5 to 9 days.	Prolonged, 10 days and over.	Total attacks.	Short, 1 to 9 days.	Long, 10 days and over.	Probable.	Certain.		Typhoid.	All other.
June	17	4	—	21	6	2	—	—	12	—	—
July	16	3	2	21	10	4	1	6	11	1	—
August	22	10	3	35	25	23	6	88	117	5	—
September	26	28	14	68	45	75	37	183	295	23	—
October	28	10	7	45	5	15	39	79	133	18	—
November	16	9	2	27	8	19	4	20	43	3	—
December	7	6	4	17	11	5	6	2	13	—	—
Total	132	70	32	234	110	143	93	378	614	50	—

A rectification of the total number of so-called long malaria, etc., as given in the above summary table by months, should be made by reducing the total of 143 to 141, thus requiring a corresponding reduction in the number of total probable typhoid attacks from 614 to 612.

The above tabulated deaths from disease, by months, were distributed among the companies of this regiment as follows:

	Company.												Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
Typhoid	2	5	1	4	8	4	5	3	9	3	4	2	50

The following is a series of three tables showing, by companies, respectively, the attacks of typhoid, of so-called malaria, etc., and of intestinal disorders in individuals (*a*) who have had no other recorded attacks (of the categories we have been considering) and (*b*) who have had such other attacks:

Combinations of typhoid fever in the Forty-ninth Iowa.

	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
Certain typhoid (uncombined)	35	38	18	30	34	21	31	22	28	30	31	16	4	338
Probable typhoid (uncombined)	3	4	5	8	2	9	11	12	9	10	9	...	3	85
Typhoid beginning in diarrhea	—	—	—	—	—	1	—	1	2	2	1	1	—	8
Typhoid preceded by diarrhea	2	4	6	—	2	—	—	—	—	2	—	—	—	16
Probable typhoid preceded by diarrhea	—	1	2	2	—	—	—	—	—	—	—	—	—	5
Typhoid followed by diarrhea	1	—	1	1	1	—	—	—	—	—	—	—	—	4
Probable typhoid followed by diarrhea	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Typhoid preceded by malaria	—	—	1	1	2	3	—	—	1	—	—	—	1	9
Probable typhoid preceded by malaria	—	—	—	—	—	—	1	—	—	—	—	—	—	1
Combinations of three diseases	—	—	—	—	2	1	—	—	—	—	—	—	1	4
Total certain typhoid ..	38	42	26	32	40	26	31	23	31	34	32	17	6	378
Total probable typhoid ..	3	6	7	10	3	9	11	13	9	10	9	...	3	93
Total probable and certain typhoid ..	41	48	33	42	43	35	42	36	40	44	41	17	9	471

Combinations of continued or malarial fevers in the Forty-ninth Iowa.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Short malaria (uncombined).....	5	4	2	10	8	10	6	4	10	13	...	1	3	76	
Short malaria preceded by diarrhea.....	...	...	2	1	...	1	1	...	...	...	1	...	...	6
Short malaria followed by diarrhea.....	1	1	1	...	1	...	...	...	...	...	1	...	...	5
Two attacks short malaria.....	1	...	...	...	...	...	...	...	1	...	2	...	...	4
Short malaria preceded and followed by diarrhea.....	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Short malaria, diarrhea and short malaria.....	...	...	...	...	...	...	...	...	...	1	...	...	...	1
Short and long malaria.....	...	...	...	...	1	...	...	...	1	...	...	...	...	2
Long malaria (uncombined).....	12	19	4	14	12	7	7	6	11	6	15	9	3	125	
Long malaria preceded by diarrhea.....	1	...	1	1	1	1	...	...	1	...	...	...	...	6
Long malaria followed by diarrhea.....	1	...	...	1	2	...	1	...	...	...	...	...	...	5
Long malaria preceded and followed by diarrhea.....	...	...	1	...	...	...	...	...	...	...	...	...	...	1
Total short malaria.....	8	5	6	12	14	14	7	5	14	15	4	1	5	110	
Total long malaria.....	14	19	6	16	16	10	8	6	13	6	17	9	3	143	

Totals include malaria in typhoid combinations.

Intestinal disorders in the Forty-ninth Iowa.

	Company.													Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.			
Single short diarrhea.....	5	3	11	11	2	10	10	...	7	11	3	1	2	76	
Two attacks short diarrhea.....			1		1		1				1	1		5	
Short and long diarrhea.....	1	1	1			1			1		1			6	
Short and prolonged diarrhea.....			1						1					2	
Long diarrhea.....	2	6	2	3	4	3	2	1	...	2	4	2	1	32	
Long and short diarrhea.....			1											1	
Long and prolonged diarrhea.....			1			1								2	
Prolonged diarrhea	3	8	4	2	4	2	6	...	3	2	3	3		38	
Total diarrhea	18	26	43	20	21	24	21	1	15	18	16	7	4	234	

Totals include diarrhea in typhoid and malaria combinations.

The records of sickness in this regiment were found to be somewhat incomplete and to some extent conflicting. By way of illustration: We have encountered 15 cases of so-called short malaria whose final disposition is not indicated in the medical records. How many of these may have really been typhoid fever it was of course impossible for us to estimate. Moreover, there is 1 of the fatal cases of typhoid fever which we have been unable to tabulate for lack of proper initial date. Then, again, there were 5 fatal cases of typhoid fever, of which the only record we have found was the return made to the Adjutant-General's Office of the deaths of the soldiers in question caused by typhoid fever. And again, there were 4 deaths of soldiers suffering from typhoid fever which were noted in the medical records, but the corresponding record of death was not found at the Adjutant-General's Office. The above tabular statement should, we think, be regarded as a fair and conservative estimate of the prevalence of typhoid fever in this regiment.

The salient points of the medical history (including morbidity and mortality) of the Forty-ninth Iowa Volunteer Infantry as a member of the Third Brigade of the Second Division may be recapitulated in the following condensed form:

(a) The regiment was in its State camp near Des Moines, Iowa, from about the 26th of April to the 11th

of June; it was in the national camp at Jacksonville, Fla., from the 14th of June to the 25th of October, having changed its camp site about the 14th of August; it was in the national camp near Savannah, Ga., from the 26th of October to the 19th of December; it was in Camp Columbia, near Habana, Cuba, from December 23 to December 31, 1898, and it was mustered out May 13, 1899, at Savannah, Ga. The initial date of the first attack suspicious of typhoid fever was June 14; the initial date of the first certain attack of typhoid fever was July 12. It is uncertain, however, if the severe epidemic of typhoid was connected with the first suspicious case, and it is doubtful whether or not the Forty-ninth Iowa arrived in the national camp at Jacksonville, Fla., already infected with typhoid fever. Its medical history as given by the board covers a period of about eight months and five days (from April 26 to December 31, 1898), and it is epitomized in the succeeding numerical data.

(b) Attacks of intestinal disorder, 234; of so-called short malaria, etc., 110; of so-called long malaria, etc., 141; of probable typhoid fever, 93, and of certain typhoid fever, 378. Total attacks of probable typhoid fever (long malaria, etc., included), 612.

(c) Total deaths from typhoid fever, 50; total deaths from all diseases, 50; mortality per cent of total probable typhoid attacks, 8.16, of total certain typhoid attacks, 13.22; per cent of typhoid deaths to all deaths by disease, 100.

(d) The mean strength was 1,236. The per cent of typhoid morbidity to mean strength as to total probable typhoid attacks was 49.51, while the average for the brigade was 26.68; as to total certain typhoid attacks was 30.58, while the average for the brigade was 16.59. The number of typhoid deaths per 1,000 of mean strength was 40.45, while the average for the brigade was 23.32, and the average for the division was 23.05.

We have endeavored to ascertain the average age (in years) of sick soldiers, grouped by the diseases we have been studying, as well as of soldiers who have died of typhoid fever, and we have obtained the following figures as to the Forty-ninth Iowa:

Disease.	Individuals.	Average age.
Short intestinal disorders.....	89	24.7
Long intestinal disorders.....	42	23.0
Prolonged intestinal disorders.....	19	24.4
Total intestinal disorders.....	150	24.2
Short malaria, etc.....	94	23.3
Long malaria, etc.....	115	23.7
Probable and certain typhoid attacks.....	434	23.1
Total probable and certain typhoid and long malaria.....	549	23.3
Grand total of all above classes.....	793	23.4
Forty soldiers who died of typhoid fever.....		22.8

For comparison of these average age figures with similar data relative to other regiments in this brigade and division, we refer to the general tables treating of this subject at the head of the Second Division of the

Seventh Army Corps. (See also similar tables relating to certain regiments of the Second Army Corps at Camp Meade, Pa.)

PECULIAR BUT GENERAL CHARACTERISTICS OF COMPANY EPIDEMICS AS EXHIBITED IN THE GRAPHIC CHART.

(a) As to the arrangement of the companies into battalions and the location of the latter there was some conflict of testimony, but as near as we could establish it the arrangement in the first camp at Jacksonville, Fla., was, from north to south, as follows: M, A, I. and L in the north battalion; E, D, B, and G in the middle battalion; C, H, K, and F in the south battalion, the battalions being separated from each other by battalion streets. The surgeon of this regiment, at the request of the board, prepared a general diagram map of this regiment with the companies arranged as in their first camp at Jacksonville. He also endeavored to indicate in the respective tents of the companies the attacks of typhoid fever which, according to him, had occurred previous to the 1st of September. (The accompanying diagram is an essential reproduction of this diagram map.) By reference to the diagram it will be seen that a large drainage ditch passes through the south battalion between Companies H and K; that this ditch joins at right angles another ditch of a similar character on the east flank of the regiment, separating the latter from the camp of the Fourth Illinois and in part from that of the Fiftieth Iowa. Reference will be made to the details given in this diagram map later. By glancing at the graphic chart it is seen that in the course of typhoid fever in the four companies constituting the north battalion there is no synchronism either in the origin, course, or ending of the curves representing sickness in these companies. As to those constituting the middle battalion the same general statement holds. Similar divergencies also exist in the lines representing the course of the sickness in the companies of the south battalion. These dissimilarities in the course of epidemics in the Forty-ninth Iowa would appear to be, on their face, incompatible with the assumption of a common, simultaneously or more or less continuously acting agency as the chief source, origin, or means of propagation of the epidemic of typhoid fever in this regiment.

(b) As in other regiments of the division, the company epidemics of this regiment present frequent greater or less exacerbations in their course, and the intervals between these exacerbations as a rule were more or less coincident with the average period of incubation of typhoid fever. It is sufficient here to make this general statement without particular references.

SPECIAL CHARACTERISTICS OF COMPANY EPIDEMICS FROM THE STANDPOINT OF LOCAL OR PECULIAR INFLUENCES.

(a) Company E was detached on provost-guard duty in the city of Jacksonville from the 24th of June to the 27th of July. This detached service could have had no

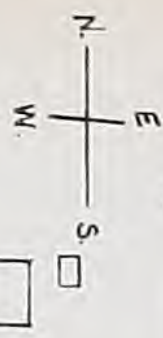
special influence on typhoid fever, as the disease was not yet at that time epidemic throughout the regiment. Company K was detached on provost-guard duty in the city of Jacksonville from June 20 to July 2 (44 recently arrived recruits of the company having been left behind in the camp with the other companies of the regiment). It is likewise impossible that this detached service could have had any influence upon the course of typhoid fever, which occurred much later in the company and in the regiment. Company M was detached at the rifle range (3 or 4 miles away from the regimental camp) from the latter part of July to the 10th of August, "the company camp there being near low, marshy ground." As to this detached service we find by reference to the graphic chart that on July 12 and 14, respectively, 2 attacks of typhoid fever occurred in this company. On the 14th of August there was 1 more attack, and after that no occurrence of typhoid fever until the 2d of September. It is not evident, therefore, that the service of this company above mentioned while detached from the regiment exercised much protective influence, since the epidemic in the regiment had not yet become very general. Attention may be called to the fact, however, that the adjoining company (A) in the same battalion experienced a rather sharp outbreak of typhoid fever within four days after the return of Company M, and that Company I of the same battalion developed 2 attacks of typhoid fever just about the date of the detachment of Company M, and that Company L developed a group of 4 cases of typhoid fever between the 2d and 9th of August, inclusive. (The beginning of the detached service of Company M is not definitely determined, the only statement being the return of the company from the rifle range on August 10, "where it had been on duty some weeks.")

Company M was again detached on patrol duty (place not stated) from September 1 to 10, but during this time it was encamped with the regiment. This special service included night work, each detail being three hours on and six hours off duty. With regard to this latter service it is difficult to estimate the exact influence, since from the 2d to the 5th of September, inclusive, there was an outbreak of 4 cases of typhoid fever, which of course received their infection prior to the detachment. From the 11th to the 16th of September, inclusive, there were 4 attacks developed, which we may infer received their infection during the early part of this detached service. But whether the individual cases received their infection from the surrounding districts which were patrolled, or whether the cases constituting the outbreak in the company from the 2d to the 5th, as already mentioned, it is impossible to say. Neither can it be affirmed with any positiveness that the general conditions existing in the regimental camp were not responsible for the development of these cases. Company M was also on detached duty at the rifle range from September 18 to October 25. Reference to the graphic chart shows

(CAMP OF 4th ILLINOIS)

DITCH DRAINING 49th IOWA AND 4th ILLINOIS CAMPS.

DITCH DRAINING 50th IOWA AND 4th VIRGINIA CAMPS.



PREVALENT WINDS.

HYDRANT.

BATH.

SINK.

HYDRANT. (ALONG LINE OF WATER-PIPE)

BATH.

HYDRANT.

SINK.

HYDRANT.

BATH.

SINK. HYDRANT.

KITCHENS.

MESS TENTS.

SKETCH MAP OF FIRST CAMP OF 49th IOWA AT JACKSONVILLE. SHOWING TYPHOID ATTACKS IN TENTS (AFTER THE SURGEON)

Co. M DETAILED TO RIFLE RANGE JULY 27th TO AUGUST 14th.

Co. A ON COUNTY PROVOST DUTY JULY 16th TO 24th.

Co. D ON COUNTY PROVOST DUTY AUG. 6th TO 13th.

Co. K ON PROVOST DUTY IN CITY OF JACKSONVILLE, JUNE 25th TO JULY 2nd.

Co. F MOVED TO HIGHER GROUND NEAR + ABOUT JULY 6th.

COMPANIES.

M

A

I

L

E

B

G

D

C

H

K

F

LUMBER

LINE

GUARD TENTS

3 BATT.

MARSHY

GROUND

REGIMENTAL

2 BATT.

HEADQUARTERS

BAND

MARSHY

GROUND

MAJOR 1 BATT.

OFFICERS MESS.

OFFICERS.

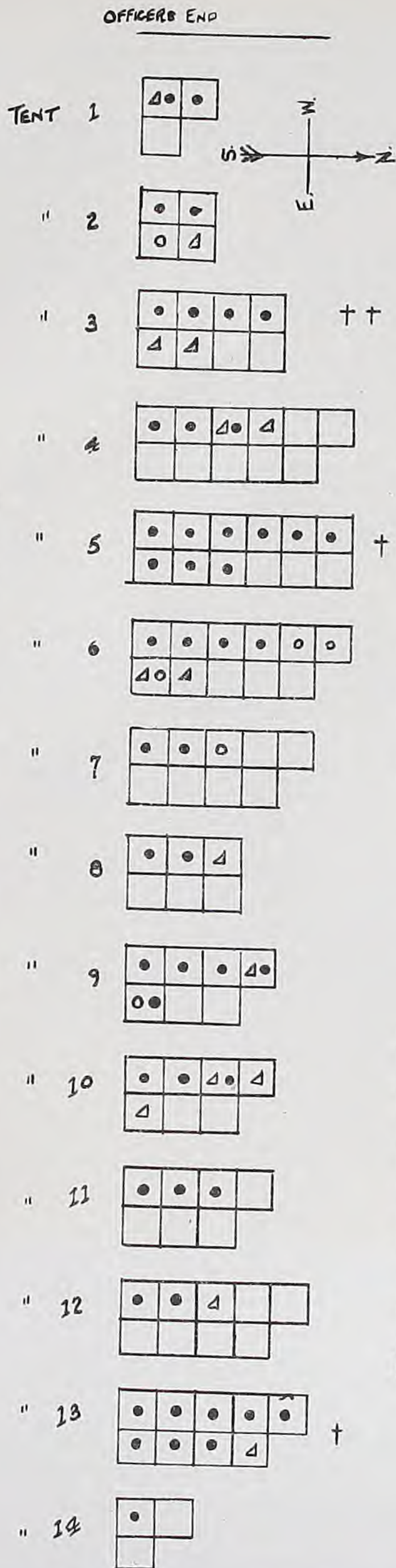
+

(CAMP OF 4th VIRGINIA)

Diagram of Co. "D" 29th Iowa,

SHOWING INDIVIDUALS IN TENTS, AND THOSE ATTACKED WITH TYPHOID FEVER, ETC.

CONSTRUCTED IN PART FROM DATA FURNISHED BY THE CAPTAIN COMMANDING. —



● = TYPHOID FEVER ATTACKS IN THE INDIVIDUAL.

△ = DIARRHOEAL ATTACKS IN THE INDIVIDUAL.

✕ = DEATH FROM TYPHOID WITHIN THE TENT.

A COMBINATION OF ABOVE MARKS WITHIN A SQUARE = SUCCESSIVE ATTACKS IN THE SAME INDIVIDUAL.

□ = NUMBER OF INDIVIDUALS IN THE TENT.

○ = MALARIAL OR FEBRILE ATTACK OF LESS THAN 10 DAYS IN THE INDIVIDUAL.

N.B. — FIVE MEN WHOSE QUARTERS WERE FORGOTTEN COULD NOT BE PLOTTED; AMONG THEM WERE ONE CERTAIN AND TWO PROBABLE TYPHOIDS. INDIVIDUALS IN 14 TENTS = 106. TYPHOID ATTACKS PLOTTED IN 14 TENTS = 50; OF THESE 42.00% WERE GROUPED IN THREE TENTS (5, 9, 13). IN THESE THREE TENTS THE PERCENTAGE OF TYPHOID ATTACKS AS PLOTTED TO INDIVIDUALS WAS, RESPECTIVELY — 75.00%; 71.42%; 88.88%. 26 TYPHOID ATTACKS IN FIRST 7 TENTS; 24 ATTACKS IN LAST 7 TENTS.

that during this period of detachment there were only four times when the company suffered from typhoid fever—1 attack near the beginning, 1 near the end, and a group of 6 attacks about the middle of that service. The first attack mentioned could not have received its infection during the detachment. The infection in all of the others must have taken place during the continuance of that detached duty. Finally, with regard to the detached service of this company, it may be noted that this was the only company of the regiment which escaped a severe epidemic of typhoid fever. It is reasonable to assume that this relative immunity was attributable to its frequent and more or less prolonged removal from the operation of influences common to the camps of the regiment. Company B was detached from the regiment on provost-guard duty in the city of Jacksonville from August 12 to 22. By reference to the chart it will be seen that this company was already infected at the time of its detachment, for a case of typhoid fever occurred on the 15th of August. This was followed by a sharp outbreak of 7 attacks of the disease between the 22d and 27th, inclusive, culminating on the 24th in 3 attacks.

The latter group of cases may be inferred to have obtained their infection about the time or a little after their separation from the regiment on this detached service. There was a cessation of attacks from the 28th of August to the 8th of September, inclusive. This latter would seem to warrant the inference that at least during the latter half of this detached service there was no new infection or spread of the old infection. After the last date mentioned there was a severe recurrence of the epidemic in this company, as will be seen by reference to the chart. Company D was detached on patrol duty in the rural districts in the neighborhood of the camp from August 6 to 13, but it is not stated whether the company occupied a camp during that time separate from the regiment. Previous to that detached service this company had experienced no attacks of typhoid fever. On the 15th, 16th, and 25th of August, respectively, there was 1 attack. On the 31st of August and the 2d of September there was 1 each. Ten days from this time the epidemic in this company began to be more or less continuous. We may infer, therefore, from the facts above cited, that this company was first infected during the time of its detached service on patrol in the surrounding country. Company G was detached from the regiment on provost-guard duty in the city of Jacksonville from September 9 to 16. Reference to the graphic chart will show that this company was already experiencing a serious outbreak of typhoid fever at the time of its detachment, and it continued to suffer from the disease during the whole of that period. A most severe outbreak occurred on the 19th, 20th, and 21st, inclusive, immediately after it rejoined the regiment. The disease continued to prey upon this company for some weeks thereafter. It can not be said therefore, that this detached service exercised any beneficial influence upon the course of the disease in this company.

(c) We regret that, owing to the impossibility of definitely establishing the route of the scavenger carts with reference to the location of the companies constituting this regiment, it has been impossible to make any estimation of the influence of winds in transporting germ-laden dust through this regiment.

SPECIAL CHARACTERISTICS OF CERTAIN COMPANY EPIDEMICS AS EXHIBITED BY THE GENERAL LIMITATION OF SICKNESS TO CERTAIN SQUADS OF MEN AS THEY WERE GROUPED IN TENTS, VIEWED FROM THE STAND-POINT OF A POSSIBLE TENT, SQUAD, OR COMRADE INFECTION.

(a) We have endeavored to ascertain the names of soldiers as they were grouped in their tents during the period of encampment at Jacksonville in order to examine into this important subject. To this end we have requested such data from two different sources, namely, from the regimental surgeon and from the commanding officers of the companies of the regiment. We regret, however, that the data bearing upon this subject obtainable from this regiment have been exceedingly meager. We have been unable to obtain the names of soldiers occupying tents, except from the captain of Company D. Having obtained the names of the men of Company D as grouped in their tents we were able to trace the recorded medical history of each person named, and in this manner to spot in their respective tents attacks of typhoid fever and all other related illness. In this regiment while in the first camp at Jacksonville the tents were in a single row on one side of the company street. (See accompanying diagram of Company D, showing individuals in tents, and those attacked with typhoid fever, etc.) It appears there were 14 tents in the line of Company D. In these 14 tents, containing 106 individuals, there were 50 attacks of typhoid fever platted. Of the latter 44 per cent were grouped in 3 tents (5, 9, and 13). In these 3 tents the percentage of typhoid-fever attacks as platted to individuals was, respectively, 75, 71.42, and 88.88. In the 7 tents near the officers' quarters there were 58 individuals and 26 attacks of typhoid fever, or 44.83 per cent of typhoid morbidity. In the 7 tents nearest the kitchen and latrine there were 48 individuals and 24 attacks of typhoid fever, or 50 per cent of morbidity. It is thus apparent that in this particular company the morbidity from typhoid fever was slightly greater among the men occupying the tents nearest the latrines. The squad groups of the sick as platted in their respective tents would seem to be incompatible with the assumption that the chief factor in the propagation of typhoid-fever infection throughout the company in question may have been some agency whose influence was common and pretty constantly acting upon the whole company; on the contrary, they would appear to suggest a mode of disseminating infection which more effectively reached and acted upon certain groups or squads of men while it passed by others, and which would be entirely compatible with the assumption of a dominating tent, squad, or comrade infection.

(b) A further indication of the existence and active influence of a tent, squad, or comrade infection in this command is the following result of a careful analysis we have made of the records of sickness in Company D of this regiment in connection with the grouping of the infected men in their respective tents, and the average time elapsing between successive attacks in the same tent and adjoining tents. Of 50 platted attacks of typhoid fever in this company there were 41, or 82 per cent, separated by intervals which could be fairly assumed to measure the length of the average period of incubation of typhoid fever.

ESTIMATION OF THE AVERAGE LENGTH OF INCUBATION OF TYPHOID FEVER.

We have endeavored to calculate the average period of incubation in this disease from data obtained from two different sources, and we have found in the general averages a striking coincidence in the figures thus obtained:

(a) Period of incubation as deduced from the length of intervals between successive or "connectable" attacks of typhoid fever occurring in the same or adjoining tents. Fifty platted attacks of typhoid fever in Company D of this regiment furnished thirty instances from which we could calculate the average interval separating connectable attacks. The average was found to be eleven days.

(b) Period of incubation as deduced from the length of intervals between attacks of diarrhea preceding typhoid fever and the development of the typhoid-fever attacks. The Forty-ninth Iowa furnished 10 examples of diarrhea preceding an attack of typhoid fever by intervals which could be regarded as measuring the average period of incubation. The length of these ten intervals averaged 13.5 days.

N. B.—For similar data concerning other regiments of this division, see tables of the Seventh Army Corps relative to this subject; and similar tables of the Second Army Corps. See also general discussion of this subject.

GENERAL DISCUSSION OF TYPHOID FEVER IN THE SECOND DIVISION, SEVENTH ARMY CORPS.

In briefly discussing the course of typhoid fever in the Second Division it is important to bear in mind that of the 9 regiments originally constituting this division 4 imported typhoid into this camp, viz, Second Illinois, First Wisconsin, Second Virginia, and Fourth Virginia. It is probable that the First North Carolina also imported the disease.

During the period from May 23, 1898, when these regiments began to arrive, until June 30 we observe that 77 cases of typhoid fever have occurred in this division in a strength of 10,759 men, or at the rate of 7.15 cases per 1,000 of mean strength. We further note that 58 of these cases occurred in regiments that imported the disease, and 13 additional cases in the First North Carolina, which we have reason to believe also imported typhoid. On the other hand, only 6

cases had occurred in the 3 regiments that did not import typhoid fever.

By reference to the graphic charts for this division, however, it will be plainly seen that while all regiments had cases of typhoid fever by June 30, the disease affected only certain companies in different regiments. Thus, in the Second Illinois 7 companies had no cases of typhoid fever, in the Fiftieth Iowa 9 companies had no cases, in the First North Carolina 3 companies had none, and in the Second Virginia 3 companies had none. As all the companies of the several regiments had the same water supply, it is impossible to look to a contamination of the water as the source of infection.

The infection having been established in all regiments by June 30, we find that during the next fifteen days the cases have risen to 110, or at the rate of 10.2 cases per 1,000 of mean strength. This rate steadily rises for the period July 16 to 31, there having occurred 197 cases, or at the rate of 18.3 per 1,000 men, thus giving for the month of July 28.53 cases per 1,000 men, as against a rate of 7.24 for June.

The worst infected regiment in this division during July was the First Wisconsin, which had 89 cases; the least infected regiment, with 11 cases, was the Forty-ninth Iowa—regiments whose camp sites and general surroundings appeared to be the same, except that the dust from the shell road, along which the scavenger wagons passed, was supposed to have been concerned in spreading infection among the men of the former regiment.

We have already, in a careful examination of this question (see history of the First Wisconsin), shown that, however natural and plausible this theory of dust infection may have appeared, the facts do not substantiate it. While it is possible that isolated cases were due to this mode of infection, it can not be assigned as the chief cause.

During the month of August we find a steady increase in the number of cases of typhoid fever, all regiments except the First North Carolina showing an increase of cases, although unequal, so that for this month 858 cases are recorded. The rate per 1,000 men has, therefore, risen from 28.53 for July to 79.74 for August. We again call attention to the graphic charts, which show that the disease was manifested by a series of company epidemics which varied much in their time of commencement, their course, and time of ending.

On August 1, two regiments—viz, the First Wisconsin and Fiftieth Iowa—were removed from their infected camp sites and placed upon higher ground about 1 mile to the west of their former camp. On August 14 the Second and Fourth Virginia and the Forty-ninth Iowa were also moved to a camp near the St. Johns River, about 3 miles northeast from the first camp. We have been unable to observe that any reduction of cases of fever resulted from this move. On the contrary, we find a marked increase of cases in the First Wisconsin, Fiftieth and Forty-ninth Iowa, and no reduction in cases in the two Virginia regiments. Since each of these carried along with them many men already infected,

together with infected clothing and bedding, the result is just what we should have been led to expect.

On August 8 the Ninth Illinois Infantry arrived from its State camp at Springfield, Ill., and was placed near the Fiftieth Iowa, 1 mile west of the old camp. This regiment imported typhoid fever, and had, prior to the end of August, 22 cases of this disease in its Florida camp. Like the other regiments of this division, it was provided with half tubs for the disposal of excreta.

The beginning of September, the fourth month of the Jacksonville encampment, found the regiments of the Second Division occupying three distinct camps, as follows: The original camp site by the Second Illinois, First North Carolina, and the Second New Jersey, forming the First Brigade; the Second Brigade, consisting of the First Wisconsin, Fiftieth Iowa, and Ninth Illinois, located 1 mile west of the old camp; and the Third Brigade, consisting of the Second and Fourth Virginia and Forty-ninth Iowa, occupying a new site 3 miles northeast of the old camp. Of the regiments which continued to occupy these camp sites during September, typhoid fever increased steadily in all. Three regiments were moved during the month, viz, Second New Jersey to Pablo Beach on September 2, First Wisconsin to its State encampment on September 7, and the Fiftieth Iowa also to its State camp on September 17. In all of these regiments there is an apparent great reduction in cases of typhoid fever following their respective moves, but this is due in the cases of the First Wisconsin and Fiftieth Iowa to absence of any records after the date of their departure. In the case of the Second New Jersey there was a reduction in cases from 156 for August to 106 for September, and this reduction may be real, as the regiment was occupying a salubrious site on the beach at Pablo, Fla., during the entire month of September. To the defectiveness of the records from the Pablo Beach hospital was probably partly due this decrease in cases of typhoid fever. In calculating the progress of typhoid fever for the month of September we therefore only include those regi-

ments which were not subjected to any movement during the month. We thus find in a mean strength of 7,222 men 733 cases of typhoid fever, or a rate of 100.15 cases per 1,000 of strength, as compared with 79.74 per 1,000 for August. Looking at the charts of the individual regiments, we find that all show a marked increase of cases except the Second Virginia, in which there are recorded the same number of cases for September as for August, but there are no records of this regiment for the last days of September. The largest increase occurred in the Forty-ninth Iowa—295 cases, as against 117 for August. When we recall that this regiment had been given a new camp site on August 14, and that its method of disposal of excreta had been changed from the very objectionable and much criticised "tub system" to that of dug pits, and that each soldier was required to cover his stool immediately, under the eye of a sentinel, we are inclined to admit that there must be other means concerned in the propagation of typhoid fever in military camps than the transference of the specific bacillus by flies. The infection which had taken such a hold on this regiment was still manifested by the occurrence of 133 cases during October, the first twenty-five days of which were spent in the same camp. By reference to the graphic chart it will be seen that the course of the disease was characterized by company epidemics, and that while Companies E, K, and L had but 1, 3, and 5 cases, respectively, other companies were much afflicted. In the Ninth Illinois typhoid fever continued to prevail during October, there being recorded 82 cases, against 101 for September. The same remark may be applied to the Second Illinois, the First North Carolina, and the Fourth Virginia, the only remaining regiments of the Second Division at Camp Cuba Libre, although there was a marked reduction in the number of cases.

During the last week in October, 1898, the Second Division was transferred to Savannah, Ga. (For details of the later occurrence of typhoid fever see regimental histories.)

Table showing, for the regiments of the Second Division of the Seventh Army Corps assembled at Jacksonville, Fla., the mortality and morbidity from typhoid fever.

Regiment.	Mean strength.	Cases of typhoid fever.		Deaths from typhoid fever.	Deaths from all diseases.	Deaths from typhoid fever in 100 cases of—		Percentage of deaths from typhoid to deaths from all diseases.	Morbidity of typhoid fever in 1,000 men strength.		Deaths from typhoid fever in 1,000 of mean strength.
		Certain.	Certain and probable.			Certain typhoid.	Certain and probable.		For certain cases of typhoid.	For certain and probable cases of typhoid.	
Second Division, Seventh Army Corps.											
Second Illinois	1,095	253	341	18	22	7.11	5.27	81.81	231.05	311.41	16.43
First North Carolina	1,164	147	227	16	20	10.88	7.04	80.00	126.28	195.01	13.74
Second New Jersey	1,153	185	318	29	32	15.67	9.11	90.62	160.45	275.80	25.15
First Wisconsin	1,232	209	311	46	48	22.00	14.79	95.83	169.64	253.43	37.33
Fiftieth Iowa	1,097	164	253	33	33	20.12	13.04	100.00	119.49	250.62	30.08
Ninth Illinois	1,288	153	248	18	28	11.76	7.25	64.28	118.80	192.54	13.97
Second Virginia	1,220	105	152	17	20	16.19	11.18	85.00	86.06	124.59	13.93
Fourth Virginia	1,274	135	231	21	28	15.55	9.09	75.00	105.96	181.31	16.48
Forty-ninth Iowa	1,236	378	612	50	50	13.22	8.16	100.00	305.82	495.14	40.49
Total	10,759	1,729	2,693	248	281	14.31	9.20	80.25	160.70	250.30	23.05

CHAPTER XII.

TYPHOID FEVER IN THE THIRD DIVISION, SEVENTH ARMY CORPS.

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THE THIRD DIVISION CAMP AT JACKSONVILLE, FLA.

This division was encamped at Panama Park, about 4 miles northeast of Jacksonville. The ground selected for the camp was elevated and rolling, thus admitting of good natural drainage.

The water supply was obtained from a deep artesian well (800 feet) at Panama Park, and was piped, under constant pressure, to every company street. Its quality was, therefore, unexceptionable.

For the disposal of garbage and excreta pits were dug in the sandy soil to a depth of about 6 feet. The contents were covered with earth and lime about three times daily. During the latter part of the encampment each soldier was required to cover his stool immediately with dry earth, under the supervision of a sentinel stationed at the sink.

The regimental histories which follow must be consulted for the location of sinks, which differed much in distance from the mess tents in different regiments. In the case of the Second Mississippi, Third Nebraska, and One hundred and sixty-first Indiana these pits were dangerously close to the kitchens and mess tents.

As regards general location this camp was preferable to that occupied by the Second Division.

SECOND MISSISSIPPI VOLUNTEER INFANTRY.

ABSTRACT OF SURGEON'S STATEMENT.

[Maj. W. W. Hamilton, U. S. Volunteers.]

The regiment was mustered into service May 26, 1898, at Camp Patrick Henry, near the city of Jackson, Miss., and remained in camp at that place till June 19. Six companies, consisting of about 600 men, were quartered in one large tent, the remaining companies being quartered, each, in a smaller tent. The water supply was obtained from Pearl River and was not subjected to any process of filtration or purification before being used. Excreta were deposited in pits, which were dug in a clay soil and were not very carefully attended to. There was considerable rainfall during the encampment, which interfered with the proper care of the sinks. Diarrhea prevailed to a considerable extent at Camp Henry, affecting all the companies. Typhoid fever appeared within two weeks from the time the companies began to assemble. The first cases were in Companies A and F. The number of cases that occurred while in camp at Jackson City could not be positively stated. One case, which was transferred to a city hospital and which terminated fatally after the

departure of the regiment for Florida, developed within two weeks of the soldier's enlistment. No other case was left behind at Jackson, Miss., but a number of men were brought along with the regiment who exhibited symptoms of typhoid fever so soon after reaching Jacksonville, Fla., that they were believed to have been infected at Camp Henry. The case of typhoid fever left behind at Jackson belonged to Company G, which was not quartered in the large tent. The regiment left Jackson, Miss., on June 19, arriving at Jacksonville, Fla., June 21, 1898. It was the same day placed in camp at Panama Park, about 5 miles from Jacksonville. Its camp site was considered to be unobjectionable, consisting of sandy soil with a rolling surface. This was the first regiment of the Third Division, Seventh Army Corps, to arrive at Panama Park. An abundant supply of water from deep artesian wells had already been piped to the camp site, or was supplied not later than the next day after the regiment's arrival. On this point Major Hamilton could not be positive. Excreta were deposited in pits which were at first located within 20 paces of the mess tents, but were later placed at a distance of about 30 yards. The necessity for a proper drill ground caused the sinks to be located so near the kitchens.

From the time of the arrival of the regiment at Panama Park diarrhea was the prevailing disease, but was not so general as when in camp at Jackson, Miss. Cases of typhoid fever appeared within a very short time after arrival at the new camp, certainly within two weeks, and cases have continued to occur since that time. The regimental surgeon, while admitting the presence of a certain number of genuine typhoid fever, was of the opinion that the majority of the cases of fever affecting the men of the Second Mississippi should be considered as typho-malarial fever. He acknowledged that these were continued fevers which did not yield to quinine, the latter remedy affecting the temperature for a little while only, after which it returned to its former elevation. Some of the cases of continued fever had returned to duty in about two weeks. There had been during July and August perhaps 70 cases of the fever, with 7 deaths. At the time of the regiment's arrival at Jacksonville, and until a division hospital could be established, these fevers were treated in the regimental hospital, which consisted of 3 hospital tents and 3 wall tents, having a capacity of 30 beds. The tents in which typhoid-fever cases were treated were separated from the other hospital tents. Men having fever would be treated in their own company tents for a few days, until a diagnosis could be made or until the case was considered suspicious; so that, for a few days, men affected with typhoid fever would be sleeping in tents with other soldiers. In order to arrest progress of the disease, in addition to isolation in special tents, as soon as the diagnosis could be made, the surgeon had ordered the stools to be disinfected. This disinfection was car-

ried out by sprinkling a small quantity of chloride of lime on the stool after it had been passed in the bedpan, and afterwards adding "bichloride solution 1-200." Neither the dry chloride of lime nor the bichloride solution was intimately mixed with the stool, but simply poured on, in some instances carelessly. The disinfectants were not allowed to remain in contact with the stool for any length of time. On the contrary, the bedpan was carried to the special typhoid-fever sink as soon as possible and there emptied. It was then washed with bichloride solution and returned to the tent. It was ordered that each stool should be covered with dry earth as soon as deposited in the sink. No disinfectant was used for cleansing the surface of the patient's body soiled by the passage of a stool, the parts being washed as well as possible with soap and water. Bedding and linen that had become soiled by the discharge of the sick were sent to the laundry to be boiled. No attempt was made to keep this linen separate from the linen of other patients. No other disinfection of soiled articles of clothing was carried out.

The company sinks at the Panama Park encampment had not at first been kept in good condition, but during the latter part of August an order had been issued requiring each soldier to immediately cover his stool with earth. This order had not been perfectly obeyed, as the surgeon still found uncovered feces at his daily inspection. No soldier has been punished for disobeying the order.

REMARKS BY THE BOARD.

Examination of all data available, together with the regimental reports of sick and wounded, shows that the mean strength of the Second Mississippi for the month of June was: Officers, 46; enlisted men, 1,056, and that there were 206 admissions to sick report from all causes from June 8, when the record begins, to June 30. Of these acute diarrhea contributed 92 cases; dysentery, 1 case; intermittent fever quotidian, 73 cases; typhoid fever, 15 cases; all other causes, 25. Sixty-five cases of diarrhea and 2 cases of dysentery occurred during that part of the month, June 8 to 19, while the regiment was still occupying its State camp, and 26 cases from June 22 to 30, after the regiment had reached Jacksonville, Fla.; so that the change to Florida appeared to favorably affect the prevalence of diarrheal diseases. The type of the disease was mild and of short duration in both encampments, only 5 cases lasted as long as one week and no case longer than nine days. Companies A, B, and D were more affected than other companies, having 17, 13, and 16 cases, respectively. Companies F, G, I, and K had the smallest number of cases, the two former having 4 cases each and the two latter 2 cases each. Of the 73 cases diagnosed as intermittent fever quotidian there were of less than four days' duration 43; five to seven days, 20; eight days, 5; ten days, 2; eleven days, 1; eighteen days, 1 (Private

W. A. B., Company L, admitted June 17); and twenty-six days, 1 (Private S. T. F., Company K, admitted June 30). Forty cases of this disease occurred at Camp Henry, Miss., from June 8 to 19, and 33 cases at Camp Cuba Libre, Fla., from June 23 to 30, so that the change of camp to Florida did not appear to influence the prevalence of supposed malarial diseases. The companies showing the largest number of cases were Companies A, D, E, and L, viz. 12, 7, 10, and 12 cases, respectively; the companies least affected being B, C, G, and I, with 4, 3, 3, and 2 cases, respectively. The regimental surgeon reported 15 cases of typhoid fever as occurring during the month of June, as follows:

Company A, 2 cases, June 28 and 29; Company C, 1 case, June 17; Company E, 1 case, June 24; Company F, 7 cases, June 8, 16 (3 cases), 22, and 30 (2 cases); Company G, 2 cases, June 10 and 17; Company K, 2 cases, June 23 and 29.

Companies D, H, I, L, and M had no cases during June. Eight cases occurred at Camp Henry, Miss., and 8 cases at Camp Cuba Libre, Fla., to which should be added 1 case from Company B, admitted to the general hospital at Fort McPherson, Ga., July 1. This soldier was taken sick June 18, with diagnosis "diarrhea." We would also add as probable cases of typhoid fever 2 cases of supposed intermittent fever of eighteen and twenty-eight days' duration; 1 from Company L June 17, and 1 from Company K June 30. The first case of typhoid fever in the Second Mississippi Volunteer Infantry was admitted to sick report June 8—Private H. H. S., Company F—and transferred to a hospital in Jackson, Miss., June 19, the day on which the regiment vacated its first camp. Of 6 other cases occurring at this encampment, 3 were left behind at Jackson, Miss., and 3 brought with the regiment to Camp Cuba Libre, Fla. Of the 9 cases occurring during June at the new camp, 4 occurred within the first week, and all within nine days after the arrival of the regiment at Jacksonville, Fla.

The strength of the regiment for July was: Officers, 46; enlisted men, 1,257; total, 1,303. During the month there were 433 admissions from all causes, viz. acute diarrhea, 169; dysentery, 3; intermittent fever, quotidian, 129; remittent fever, 37; typhoid fever, 30; all other diseases, 65. These figures are taken from the regimental report. Of the cases of dysentery, 1 was acute, lasting three days, and 2 were of chronic type, being sent to Third Division Hospital, Seventh Army Corps, and returned to duty at the end of fifteen and twenty days, without change of diagnosis at the hospital. Of 169 cases of acute diarrhea, 103 were returned to duty at the end of twenty-four hours; 31 after two days; 18 within three days; 7 within four days; 1 after five days; 1 at the end of six days; 2 after nine days; 6 were sent to hospital at the end of one day, of which 5 were under treatment two to four days, and 1 was changed to the diagnosis of typhoid fever. The

duration of 129 cases of supposed intermittent fever, quotidian, was: One day, 66; two days, 22; three days, 13; four days, 6; five days, 5; six days, 2; seven days, 3; eight days, 1; nine days, 1; eleven days, 2; and 8 cases were transferred to the Third Division Hospital. The diagnosis in 5 of these was changed to typhoid fever, 2 to remittent fever (the latter remaining under treatment eleven and twenty-eight days, respectively), and 1 case could not be traced. Of 37 cases of supposed remittent fever, 18 were of less than one week's duration; 3 lasted eight days; 1 nine days; 11 from ten to forty-eight days; 2 were changed to the diagnosis of typhoid fever, and in 2 cases the record could not be traced. As indicated above, 30 cases of typhoid fever were reported in the regimental returns of sick and wounded for July. To these should be added 7 cases in which the diagnosis was changed from intermittent or remittent fever to typhoid fever and 1 in which it was changed from diarrhea to typhoid fever.

It will be observed that whereas only seven companies of the regiment had cases of typhoid fever during June, 11 of the companies showed cases of this disease during July, Company M being the only one not having cases. For dates of occurrence and distribution by companies, the chart of this regiment will be consulted. Twenty-two cases occurred during the latter half of the month, as against 14 cases for the first fifteen days of July. In addition to the 34 cases of recognized typhoid fever, we find 15 cases of supposed malarial disease, which lasted from ten to forty-eight days, in spite of heavy dosing of quinine. We think that a majority of them were cases also of typhoid fever.

A careful comparison of the occurrence of diarrheal diseases and supposed malarial fevers of short duration by companies for the month of July shows that those companies having the larger number of cases of the former also have a larger number of the latter diseases, and that those companies in which diarrheal diseases were comparatively rare had but few cases of those fevers diagnosed as intermittent and remittent fever. The occurrence during July of 129 cases of intermittent fever, all of the quotidian type, would in itself seem remarkable, as indicating intense malarial infection at Camp Cuba Libre, Fla. Since there is no evidence to confirm this malarial influence, but, on the contrary, observations to prove the slight or almost entire absence of malaria during the Jacksonville encampment, it seems reasonable to suppose that the majority of these mild fever cases were due to either intestinal disturbance or the exposure incident to the new life of the young soldier, and could more properly have been designated by the term "febricula." It is not improbable that some of them were mild types of typhoid infection.

The occurrence of only 38 cases of typhoid fever for July in an average strength of 1,293 men, shows that the disease progressed slowly, and point unmistakably

to its spread by other means than contamination of the general water supply.

As compared with the preceding month, there were more admissions from all causes during August, viz., 495, of which acute diarrhea furnished 151 cases; dysentery, 4; intermittent fever, quotidian, 115; remittent fever, 97; typhoid fever, 42; all other causes, 85. These figures are taken from the regimental report of sick and wounded. Of the cases of diarrhea, 146 lasted less than four days; five days, 3; six days, 1; eleven days, 2; thirteen days, 1. Five were treated in hospital from two to sixteen days, of which 1 was changed from diarrhea to typhoid fever. The cases of dysentery lasted from two to seventeen days. Of the cases of intermittent fever, quotidian, 36 lasted less than four days; five days, 26; six days, 14; seven days, 7; eight days, 1; nine days, 1; 11 from ten to twenty-nine days, and 14 were transferred to hospital. Of the latter cases 2 were changed to the diagnosis of remittent fever and returned to the regiment at the end of six and sixteen days' treatment; 6 were returned to the regiment with the diagnosis unchanged after from ten to eighteen days' treatment; 1 furloughed at the end of forty-two days; 3 were changed to the diagnosis of typhoid fever, and 2 could not be traced. Of the 97 cases of supposed remittent fever and admitted for August 72 were treated in quarters by the regimental surgeon and returned to duty as follows: After three days, 1; five days, 6; six days, 5; seven to nine days, 27; ten to forty-two days, 33.

Twenty-five cases were transferred to the Third Division Hospital. Of these 4 were changed to the diagnosis of intermittent fever, 1 case being returned to the regiment at the end of thirty-eight days; and 3 cases each after fourteen to seventeen days treatment; 1 was changed to the diagnosis of diarrhea and sent to regiment at the end of twelve days; 6 had no change of diagnosis and were returned after six days' treatment in 2 and from twenty to thirty-one in 4 cases; 1 furloughed after twenty-four days, diagnosis unchanged; 8 changed to diagnosis of typhoid fever; and 5 could not be traced. In calculating the prevalence of typhoid fever for the month of August in this regiment, if only those cases of fever which received the diagnosis of typhoid fever by the regimental surgeon and the hospital physicians are taken into consideration, we find a total of 52 cases. This is an increase of only 14 cases over the preceding month; a result which we could not have looked for in a regiment the majority of whose companies were infected during July. If we seek an explanation of this unexpectedly slow increase of typhoid fever we find that while the supposed intermittent malarias have somewhat decreased in numbers, the supposed remittent malarial fevers have markedly increased in numbers, viz, from 37 for the preceding month to 98 cases for August. That is to say, the number of fevers of prolonged duration has remarkably increased during

August, and this, notwithstanding the most liberal dosage with quinine, to which these fevers were early subjected. We would therefore feel inclined to add to the 52 cases of typhoid fever already mentioned those supposed malarial fevers of prolonged duration, thus largely increasing the number for this month. We would here state that these supposed malarial fevers were really of longer duration than reported, as enlisted men frequently delay presenting themselves at surgeon's call, in the hope of staving off an attack of fever. This is also shown by the number of instances where death has occurred within a week or less of the soldier's admission to sick report. The reluctance of men to be sent to hospital for treatment, away from their own medical attendant and comrades, served to keep them at duty or away from the surgeon as long as their strength would permit. This applied to all regiments.

Turning to the medical history of the regiment for September, we find in a mean strength of 1,303 officers and men, there were 351 admissions to sick report as follows: Acute diarrhea, 133; intermittent fever, quotidian, 133; remittent fever, 29; typhoid fever, 10; all other causes, 46. Examining these 133 cases of diarrhea by dates of admission and return to duty, we find their duration as follows: One day, 33; two days, 23; three days, 30; four days, 18; five days, 10; six days, 10; seven days, 3; eight days, 5; nine days, 1. So that we may say that the diarrheas were as a rule of mild character. No case was of sufficient severity to warrant transfer to division hospital.

Of the 133 cases of intermittent fever, quotidian, the duration was as follows: One day, 19; two days, 21; three days, 13; four days, 23; five days, 19; six days, 18; seven days, 10; nine days, 4; ten days, 2; eleven days, 3. All of these cases were treated in quarters.

Of the 29 cases of remittent fever, the duration was: One day, 3; two days, 2; four days, 2; seven days, 4; eight days, 1; nine days, 5; ten days, 4; twelve days, 2; thirteen days, 1; sixteen days, 1; nineteen days, 1. These were treated in quarters. Three cases of remittent fever were sent to hospital, in 2 of which the diagnosis was changed to typhoid fever and 1 could not be traced.

The number of typhoid fever cases undergoes a marked reduction during September, amounting to 10 cases reported by the surgeon and 2 cases of remittent fever changed to typhoid fever, making a total of 12 cases. The number of supposed malarial cases lasting ten or more days has also undergone a decided diminution, there being only 14 of these cases against 55 cases for the preceding month.

An examination into the dates of occurrence of diarrhea, supposed malarial fevers, and typhoid fevers shows that between September 1 and 15 there were 124 cases of diarrhea, 118 supposed malarial fevers, and 9 cases of typhoid fever. There were no cases of diarrhea after September 22, and only 6 supposed malarial fevers, last-

ing less than three days, after the same date. No case of typhoid fever for this month is reported later than the 26th. Of the 14 cases of fever lasting more than ten days, all occurred prior to the 7th of September. As this regiment had maintained its camp site for two months and ten days prior to the advent of September, all of the conditions would appear to have been favorable for the occurrence of cases of typhoid fever. Still, adding these 14 prolonged fevers to the 12 cases of typhoid fever already reported would only increase the total cases of this disease for September to 26, of which 23 occurred prior to the 7th of September. There must be some good reason to account for this remarkable falling off in cases of typhoid fever. We observe, also, a remarkable reduction in the number of supposed malarial fevers and intestinal disorders after the first week in September. The fall in both of these disorders is very marked, beginning with September 9.

As regards the prevalence of supposed malarial disorders, the season and the temperature appeared to be very favorable; but, nevertheless, these diseases were evidently affected by the same influences, whatever these might be, which were arresting the progress of typhoid fever. The explanation is probably found in the strenuous efforts put forth for improved camp sanitation beginning with the latter half of August. A better explanation would be found in the abandonment of the camp site, but this did not take place till September 12, 1898, the regiment going on this date to Camp McLaurin, Lauderdale Springs, Miss. The reduction in fevers and diarrheas had already begun prior to this time. The beneficial effects of this move are not to be denied, since they are seen in the sick reports not alone for the latter half of September, but during October and November. The history of the subsidence of supposed malarial fevers in this regiment after its departure from Jacksonville for its Mississippi camp is a strong confirmation of the conclusion of this board as to the absence of malarial influences at Jacksonville. The occurrence of 118 malarial fevers during the first half of September, nearly the whole number being reported as double tertian infections, could hardly have been followed by such a prompt disappearance of this class of fevers had they really been due to malarial causes. We should rather expect a continuance of this class of fevers, even had the regiment been transferred to a northern station.

In a mean strength of 1,309 officers and men for October we find 32 admissions to sick report from all causes: Diarrhea, 8; intermittent fever, quotidian, 16; remittent fever, 1; typhoid fever, none; other causes, 7. The diarrheas were all mild and of short duration, with the exception of 1 case which could not be traced.

The duration of the 16 intermittents was as follows: One day, 3; two days, 1; three days, 1; four days, 2; five days, 1; six days, 3; seven days, 1; ten days, 1; twelve days, 1; fifteen days, 1; twenty-one days, 1. The case of remittent fever lasted twenty days.

The regiment again changed its camp site on October 15, going to Camp Hamilton, Columbia, Tenn. The men were furloughed on October 19 and reassembled for muster out on November 28. The surgeon reports the health of the regiment as being very good for November, except in the matter of respiratory diseases due to inclement weather. No diarrheal diseases are reported for this month and only 5 cases of malaria, lasting twenty-four hours.

For November, in an average strength of 1,312 officers and men, there were 46 admissions for all causes, viz, diarrhea, 9; intermittent fever, quotidian, 6; remittent fever, 4; malarial cachexia, 1; all other causes, 26. The intermittents were of short duration. The cases of remittent fever lasted ten days each. The case of malarial cachexia went to duty at the end of eighteen days.

Reviewing briefly the occurrence of typhoid fever in this regiment we find that within fifteen days of the muster in of the men, May 26, 1898, 2 cases of this disease had already occurred—one in Company F, on June 8, closely followed by a second case in Company G, on June 10. These may be set down as infections antedating enlistment. Six other cases occurred prior to the departure of the regiment from its State camp, June 19. Five of these were recognized as typhoid fever, and 1 was admitted to the sick report June 18 as "acute diarrhea." This patient was transferred to the general hospital at Atlanta, Ga., July 1, and there diagnosed as a case of typhoid fever. These 8 cases occurred in four companies, viz, B, 1; C, 1; F, 4, and G, 2. This early recognition of the presence of this disease in the regiment is highly creditable to the diagnostic ability and candor of the regimental surgeon, although to this fact must be attributed in a large degree the unsavory reputation which the Second Mississippi afterwards had in its Florida encampment as a badly infected regiment compared with other regiments in the Third Division of the Seventh Corps. Not only did typhoid fever appear early in the State camp, but some of the patients were also brought along with the regiment to Florida and were treated in the regimental hospital for at least one month thereafter. Arriving in Jacksonville on June 21, 9 additional cases were recorded for that month, 4 of these occurring within the first week and all within nine days after the arrival at the new camp, thus pointing plainly to infection prior to departure from State encampment. The course of the disease at Camp Henry, Miss., would seem to exclude infection of the general water supply, derived from Pearl River, as shown by the small number of cases affecting any one company and the entire absence of the disease in five companies. The disease would appear rather to have been brought to Camp Henry by the arrival of recruits and thereafter added to by individual infection in the city of Jackson, Miss., near which city the camp was located. A very impor-

tant fact, clearly established, is the importation into its Florida camp of undoubted cases of typhoid fever, some of which proved fatal early in July. A second important consideration, influencing the subsequent spread of the disease in the regiment, is that all of these cases of fever were treated in the regimental hospital until recovery or death, as the division hospital was not yet established; moreover, that the excreta were deposited in pits not farther removed from the mess tents than 30 to 40 yards. Total cases of typhoid fever for June, 18. During July, with a strength of 1,303, there were 38 cases of recognized typhoid fever, all of the companies except M having cases of the disease. The largest number of cases in any one company was 7 (Company F). The disease had thus made rather slow but steady progress during July. Intestinal disorders had decreased moderately as compared with June, but the cases were, as a rule, short and mild in character.

The number of cases diagnosed as intermittent fever, quotidian, increased during July, there being 129 as against 73 for June, while 37 cases were entered under the head of remittent fever against none reported for June.

During August, 52 cases are reported, although, as we have already stated, this does not represent the full prevalence of the disease, since many cases were reported as malarial remittent fever.

To sum up, we find that typhoid fever beginning in this regiment at its State encampment during June is not arrested by the transfer of the command from Mississippi to Florida, for reasons easily understood, as heretofore set forth; that during the months of July and August it continued to slowly but steadily increase until about August 20, from which time there was a steady reduction until September 3, after which date there is an abrupt cessation of the disease in all companies of the regiment.

Arrived at Panama Park, June 21; imported typhoid fever, about 12 cases; first case, June 8 at State camp; June, 17 cases of typhoid fever; July, 39 cases of typhoid fever; August, 52 cases of typhoid fever; September, 12 cases of typhoid fever; left Panama Park September 12.

FOURTH ILLINOIS VOLUNTEER INFANTRY.

ABSTRACT OF SURGEON'S STATEMENT.

[Maj. T. C. McCord, U. S. Volunteers.]

The regiment was mustered into service May 20, 1898, at Camp Tanner, Springfield, Ill. It remained in this camp until May 26. Its water supply was that of the city of Springfield, and its fecal disposal by means of water carriage. During this encampment there was but little sickness; mild bronchial affections, simple diarrheas, and a few intermittent fevers occurred.

The regiment left Camp Tanner, Ill., May 26 and arrived at Jacksonville, Fla., on May 29. It was assigned to the Third Division, Seventh Army Corps, and went into camp to the north and near that of the Fiftieth Iowa Volunteer Infantry. This site was described by the regimental surgeon as low ground, not well drained, and where water frequently stood in places after heavy rains.

When the regiment arrived in Jacksonville water had already been piped to the camp from the general city supply. Half tubs were used for the reception of excreta. These tubs were at first located about 200 yards distant from and to the west of the mess tents. Later the arrival of the Fiftieth Iowa caused these receptacles for excreta to be brought nearer, being thereafter about 100 yards distant. Although their own sinks were distant about 100 yards, the scavenger wagons, employed for the removal of these and other tubs passed daily along a street at a distance of about 50 feet from the company tents. The various companies of the regiment have done outpost duty, such as guarding watermelon patches, besides duty at the rifle range and marches. While on these short marches the men carried hydrant water in their canteens and were not permitted to use water from other sources.

REMARKS BY THE BOARD.

The testimony of Major McCord and an examination of the regimental and division hospital records show that the health of the regiment was good during the month of June. In a total strength of 1,026 officers and men, 57 were taken sick from all causes. During the month simple diarrheas (11), intermittent fever, quotidian (13), and venereal disease (8 cases), were the prevailing diseases. The diarrheas and malarial fevers were mild and of short duration. No case of typhoid fever occurred during the month.

During July the number of cases of diarrhea was 12, but it is to be observed that the patients did not so soon return to duty. Of the 7 cases admitted during the latter half of July, none of them were of short duration, all remaining on sick report at the end of the month. The duration of these diarrheas varied, indeed, from ten to thirty-eight days. One case, Company B, admitted July 26, after treatment in quarters for three weeks, was transferred to hospital (August 16), where the diagnosis was changed to typhoid fever. Of the malarial fevers there were 16 cases, chiefly of intermittent type and of short duration. Two cases diagnosed as remittent fever, one from Company D and the other belonging to Company G, were transferred to hospital on July 15 and 19, respectively, the cases remaining in hospital eighteen and thirty-five days, at the expiration of which time they were sent to quarters convalescent, but not yet able to do duty. Not only did the character of the diarrheas change and the fevers become more prolonged

during the latter half of July, but cases of typhoid also began to appear. The first case of this disease was admitted on July 11, a private of Company G. July 13, 2 cases of typhoid fever were sent to hospital from Company K; July 24, 1 case to hospital from Company B, and July 26 a case from Company D. These cases, it should be added, were not, at the time of their transfer to the hospital, considered to be other than cases of malarial fever or diarrhea. On August 1 a member of Company H, having been admitted to quarters as a case of malarial fever, was transferred to hospital on August 3, where he died August 8. At autopsy ulceration of Peyer's patches was found. This was, therefore, the first case diagnosed as typhoid fever. It was only at this date, August 8, that the presence of typhoid fever in the regiment was recognized, although cases of this disease had been sent to hospital as early as July 11 and 13. August 6 another case of this disease was sent to hospital from Company H, and 1 case from Company L on August 10. Average strength for the month of July was 1,303 officers and men. Total admissions to sick report for the month, 76.

On account of the low, damp character of the camp site and the prevalence of supposed malarial fevers, the regiment was, on August 11, just one month from the appearance of the first case of typhoid fever, transferred to Panama Park, Fla., and attached to the Third Division, Seventh Army Corps. It had occupied its old camp site two months and thirteen days. While at this camp the health of the regiment had been good during the month of June and the first half of July, only a few cases of fever of short duration and mild in character and simple diarrheas easily controlled having occurred. The site at Panama Park was on high ground and well drained. The water supply was brought from deep artesian wells through iron pipes and was abundant and unobjectionable. Pits for the reception of excreta were dug at a distance of 100 yards from the mess tents and to a depth of about 6 feet. The contents were covered with dry earth and lime two or three times daily. The soil was sandy and there was no difficulty experienced in digging the pits. The following is the record for diarrhea, malarial diseases, and typhoid fever for the month of August, the regiment having occupied its old camp site during the first ten days of this month, and the new camp, on high ground, during the last twenty-one days of August: Of acute diarrhea there were 25 cases; dysentery, 4; total, 29. Of these, 4 occurred in the old camp, 25 in the new camp. Twelve were mild, lasting from one to five days; 16 protracted, lasting ten to forty days, and 1 case could not be traced. Of the 16 protracted cases, 4 were diagnosed on the regimental report as acute dysentery, of which 1 was returned to duty at the end of ten days. 1 was furloughed at the end of fourteen days, and 2 were changed in diagnosis, after admission to Third Division Hospital, to that of typhoid fever. The cases

of protracted diarrhea, 12 in number, were not sent to hospital, but treated in quarters. The record shows that of these 2 were returned to duty at the expiration of fourteen days, 1 after twenty-nine days, 1 after thirty days, 1 at the end of thirty-three days, and that 7 were granted furloughs after being under treatment for periods varying from ten to forty-three days.

Of diseases diagnosed as "malarial," there were admitted to sick report 75 cases, as follows: Intermittent fever, 48; remittent, 23; malarial continued, 4. Of these, 48 were treated in quarters; intermittent, 39; remittent, 9, and 27 men were sent to the Third Division Hospital, viz, 6 intermittent, 17 remittent, and 4 continued malarial fevers. Of the 39 cases of supposed intermittent fever which were treated in quarters by the regimental surgeon, 15 were mild in character, lasting less than seven days; 9 lasted from eight to fourteen days; 8 were returned to duty at periods varying from fifteen to forty-three days; 4 were furloughed after being under treatment from thirteen to forty-two days; 2 were changed to the diagnosis of typhoid fever, and 1 could not be traced. Of the 9 cases of supposed remittent fever treated in quarters, 2 were of less than eight days in duration, 3 lasted from thirteen to nineteen days, and 2 were furloughed after being under treatment twenty-three and thirty-nine days, respectively. Of the 6 cases of supposed intermittent fever sent to the Third Division Hospital, 1 was returned to the regiment at the end of twelve days, the diagnosis remaining unchanged, and 5 were changed to the diagnosis of typhoid fever. Of the 17 cases of supposed remittent fever admitted to hospital, 5 were returned to the regiment after seven, ten, eleven, seventeen, and twenty-three days, respectively, with diagnosis unchanged; 2 were furloughed after twenty-three and forty-six days' treatment; in 9 cases the diagnosis was changed to typhoid fever, and 1 case could not be traced. Of the 4 cases of continued malarial fever admitted for August, 1 was treated in quarters and furloughed at the end of twenty-three days, and 3 were sent to the division hospital, where the diagnosis was changed to typhoid fever in each case.

The following is a summary of the three principal diseases, by companies, for the month of August, as reported by the regimental surgeon:

Company.	Diarrhea and dysentery.	Malarial diseases.	Typhoid.
A.....	5	2	.....
B.....	5	5	1
C.....	3	7	2
D.....	5	8	1
E.....	1	8	1
F.....	.....	10	1
G.....	5	7	1
H.....	4	6	2
I.....	.....	3	1
K.....	1	6	1
L.....	.....	6	3
M.....	5	5	.....
Noncommissioned staff.....	.....	1	.....
Officers.....	.....	1	.....
Total.....	29	75	14

The following is a summary of these diseases with correction of diagnosis made in the division hospital:

Company.	Diarrhea and dysentery.	Malarial diseases.	Typhoid.
A	5	1	1
B		3	3
C	3	7	2
D	5	8	1
E	1	5	4
F		4	7
G	5	7	1
H	4	6	2
I		1	3
K	1	5	2
L		6	3
M	3	5	2
Noncommissioned staff		1	
Officers		1	
Total	27	60	31

In other words, to the 14 cases diagnosed by the surgeon as typhoid fever there must be added 2 cases of supposed dysentery and 15 cases of supposed malarial disease, making a total of 31 cases of typhoid fever; 4 of these were taken sick while the regiment was still in the old camp, and 27 cases in the new camp. Twenty-four cases of typhoid fever occurred during the latter half of the month of August, 18 cases occurring during the last week of the month.

We do not believe, however, that the number of cases of typhoid fever shown in the second summary above given, viz, 31, expresses the full prevalence of typhoid fever in this regiment. The occurrence of a number of cases of protracted diarrheas, without change in the character of the water or food supply, at a time when cases of typhoid fever were on the increase, would alone create the suspicion that some of these cases were really cases of typhoid fever, and this suggestion is not lessened when it is seen that two or three cases of intestinal trouble sent to hospital were diagnosed as typhoid fever. Moreover, we have seen that 15 out of 75 supposed malarial cases were changed to typhoid fever. This number, however, certainly does not express the real number of cases of this disease. Of the 60 remaining cases, 10 supposed intermittents lasted from fourteen to forty-three days, likewise 9 remittents from fourteen to thirty-nine days. Indeed, 4 intermittents and 2 remittents were furloughed after being under treatment from thirteen to forty-two days, so that it is impossible to say just how long these cases of fever lasted. For reasons which we will give in another part of this report we would regard these 19 cases of supposed malarial diseases as probably cases of typhoid fever, to which we should be inclined to add 10 of the cases of protracted diarrhea, thus nearly doubling the number of cases of typhoid fever for the month of August.

After following all suspicious cases with the greatest care, we believe that the following summary will more nearly give the true proportion of the three principal diseases by companies for August:

Company.	Intestinal diseases.	Malarial diseases.	Typhoid.
A	3		4
B		2	4
C	3	6	3
D		3	11
E	1	3	6
F		3	8
G	5	7	1
H	2	4	6
I		1	3
K	1	2	5
L		3	6
M	2	5	3
Noncommissioned staff		1	
Officers		1	
Total	17	41	60

It would be more correct to report the 41 cases of malarial disease as cases of "supposed malarial origin," since over one-third of the number were of very short duration and hence could be more properly designated as "febricula," while the dates of the commencement of the remaining cases, lasting from seven to thirteen days, when accurately studied by companies, agree in a surprising manner with the times of occurrence of typhoid fever in the same companies; thus pointing, probably, as we think, to milder typhoid infections in more resistant individuals.

The regiment remained in its second camp until September 28, when it was detailed to provost duty in the city of Jacksonville. Its mean strength for the month was—officers, 50; enlisted men, 1,284. The admissions to sick report during the month from all causes were 206, divided as follows by the regimental surgeon: Intestinal disorders, 19; intermittent fever, 31; remittent fever, 58; pernicious malaria, 1; typhoid fever, 71; other diseases and injuries, 26.

Again, it may be pointed out that the diarrheal diseases, though few in number, were, as a rule, protracted in character, 4 only being mild and of short duration: 2 were treated in quarters and returned to duty at the end of eleven days; 8 were sent to hospital, where the diagnosis was changed in 1 case (acute indigestion) to typhoid fever, the other 7 remaining under treatment at the end of fifty-four days; 3 were furloughed within a few days of their admission to sick report, too soon for a proper diagnosis to be made, and 2 furloughed after being under treatment fifteen and thirty days, respectively. Of the 5 cases furloughed, 1 died of typhoid fever at his home, 1 was remaining on sick report at the end of sixty days, and 3 were returned to duty at the expiration of thirty-eight, forty, and fifty-three days, respectively; so that at least 2 of the cases of supposed acute diarrhea were really cases of typhoid fever. As to the real nature of the remaining 17 cases, as a positive statement can not be made, for the purpose of this report they must be placed with the diarrheal diseases. Of the 31 cases of supposed intermittent fever, 8 were treated in quarters and were on sick report two, four, five, six, ten, twelve, thirteen, and fifteen days, respectively, and 23 were treated in

division hospital. Of these 1 was changed to the diagnosis of remittent, 4 continued as intermittent, and 18 changed to that of typhoid fever.

Eight cases of remittent fever were treated in quarters and returned to duty after four, four, seven, ten, thirteen, sixteen, nineteen, and twenty-two days, respectively. Fifty supposed cases of this type of fever were transferred to the division hospital for treatment; 6 of them were returned to the regiment, diagnosis unchanged, after one, five, nine, thirteen, sixteen, and seventeen days in hospital, respectively; 3 were transferred to hospital after being on sick report six, nine, and twelve days, all further record of these cases being lost, and 41 were changed to the diagnosis of typhoid fever. The case reported as pernicious malarial fever died on the seventeenth day in quarters, and may be considered as a case of typhoid fever. It will thus be seen that the number of cases of typhoid fever, as corrected by hospital diagnosis, was 130, an increase of 59 cases over the number reported by the surgeon. Indeed, this last number does not cover all of the cases occurring during the month, since we find 25 additional cases of typhoid fever admitted from the Fourth Illinois Infantry to the Third Division Hospital during September, which the surgeon had failed to include on his regimental report of sick. This, with 1 case of supposed pernicious malaria, increases the cases of typhoid fever for September to a total of 156. As far as we have been able to trace the cases, we have found 10 deaths in this number, but many of these cases were furloughed at various stages of the disease from the division hospital, and it has been impossible to follow up these cases. Some deaths probably occurred among the furloughed cases.

It is worthy of remark that, notwithstanding the favorable conditions for a largely increased number of supposed malarial diseases for September, the relative increase, as reported by the regimental surgeon, is slight—91 cases for September as compared with 75 for August. When error in diagnosis further serves to reduce the number of supposed malarials to 31 for September, it will be seen that in spite of favorable conditions, such as heat and moisture, there was a marked reduction in malarial diseases during the latter month. This can only be explained by the absence, in fact, of malarial influences at Panama Park, Fla. To this important fact special reference will be made in another part of the report.

Continuing the medical history of the regiment, we find an average strength for October of 1,227 officers and men, with 184 admissions to sick report, as follows: Intestinal disorders, 19; intermittent fever, 35; remittent fever, 15; pernicious malarial fever, 1; continued malarial fever, 1; typhoid fever, 26; all other cases, 88. These figures are taken from the regimental report. Of the intestinal diseases 14 were treated in quarters. Of these, 8 lasted less than five days; 2,

eight days; 1, ten days; 1, eleven days; 1, nineteen days, and 1 was furloughed after two days' treatment. Five cases were sent to hospital for treatment, of which 1 was furloughed, as remittent fever, at the end of twelve days; 2 were changed to the diagnosis of typhoid fever, and 2 cases could not be traced.

Of the 35 cases of intermittent fever, 32 were treated in quarters and returned to duty, as follows: 13 after five days; 2, six days; 5, seven days; 1, eight days; 1, ten days; 2, eleven days; 2, twelve days; 2, fourteen days; 2, fifteen days; 1, nineteen days, and 1 furloughed after thirty-four days' treatment. Three intermittents were sent to hospital, of which 1 was returned to duty after seven days, 1 was changed to typhoid fever, and 1 was not traced.

Of the 15 remittents, 4 went to duty within five days; 1, seven days; 1, eight days; 1, nine days; 1, thirteen days; 1, twenty-two days, and 1 furloughed after thirty days' treatment in quarters. Five were sent to the Third Division Hospital, of which 4 were changed to typhoid fever, and 1 could not be traced.

In calculating the prevalence of typhoid fever during October, there should be added to the 26 cases furnished by the regimental surgeon 2 cases of supposed gastroenteritis, acute, 1 case of supposed intermittent fever, and 4 cases of supposed remittent fever, in which the diagnoses were changed to typhoid fever. Besides these there must also be added 3 cases of the Fourth Illinois Infantry found in the General Hospital at Fort Monroe, Va., and Fort McPherson, Ga., which were admitted during the latter part of October, but not accounted for by the regimental surgeon. We thus find the number of cases of typhoid fever increased to 36, with 4 deaths. We believe that this number fails to give the full estimate of the occurrence of typhoid fever during October. Thirteen cases of supposed malarial fever, lasting from ten to thirty-four days, 1 case of supposed continued malarial fever of seventeen days' duration, 1 case of supposed pernicious malarial fever, fatal on the second day after admission to hospital, and 1 case of supposed remittent furloughed on the thirtieth day, should be included in the estimate, thus bringing the cases of this disease up to 51 for October, as compared with 156 cases for September. This surprising reduction in all fever cases during this month, as compared with those occurring in September, is explained by the removal of the regiment on September 28 from its infected camp site at Panama Park to Jacksonville as provost guard for the city.

An examination of the dates of admissions to sick report of the 51 cases of typhoid fever shows that 35 cases were taken sick between the 1st and 15th of October and 16 cases between the latter date and October 31. Only three cases of typhoid fever were admitted later than October 18, and as one of these cases admitted October 25 died two days later it is safe to say that this patient's disease began prior to the middle of Octo-

ber. The remaining 2 cases arrived at Fort Myer, Va., on October 21, and hence must have begun several days earlier. With this explanation, no case of typhoid fever appears to have occurred later than three weeks after the regiment changed its camp site. To quote the language of the regimental surgeon: "The regiment has been on provost duty in Jacksonville during the month of October. The general health of the men was bad when the tour began, but a great improvement took place during the month." We may add that only 13 cases of fever of any description occurred after the 18th of October; and of these 6 lasted less than five days—a striking illustration of the beneficial effect which sometimes follows change of camp site.

On October 25, 1898, the regiment was moved from Jacksonville, Fla., to Savannah, Ga., where it was encamped in several stations, still performing provost duty. In the total strength of 1,234 officers and men there were 82 admissions to sick report, of which intestinal disorders contributed 10 cases; intermittent fever, 7; remittent fever, 18; typhoid fever, 1; all other diseases, 36.

Of the intestinal disorders 5 were returned to duty within seven days, 1 after nine days, 1 after thirteen days, 2 furloughed after thirty days' treatment, and 1 changed to the diagnosis of typhoid fever.

Of the intermittent fevers 4 cases were returned to duty within eight days, 1 after twenty-two days, and 1 furloughed after twelve days and 1 after thirty days' treatment in hospital.

Of remittent fevers 4 cases were sent to duty within six days; nine to fourteen days, 8; thirty-four days, 1; forty-two days, 1; fifty-three days, 1; 1 furloughed after eleven days, 1 after thirty-three days, and 1 case could not be traced.

To the case of typhoid fever reported by the surgeon must be added 1 case changed from chronic gastritis to typhoid fever in the division hospital, 2 cases found in the Emergency Hospital, Seventh Army Corps, and 2 cases in the First Division Hospital, making a total of 6 cases for the month. The 3 cases of remittent fever lasting from thirty-four to fifty-three days were probably cases of typhoid fever. The marked improvement in the general health of the regiment as compared with October is to be noted.

For the month of December, in an average strength of 45 officers and 1,105 enlisted men, there were 165 admissions to sick report, divided as follows: Intestinal disorders, 35; intermittent fever, 35; remittent fever, 6; typhoid fever, none; typhoid convalescent, 2.

The intestinal disorders were brief in duration, the majority being returned to duty within three days, 2 cases lasted from nine to fourteen days, 1 was still sick December 30, after nine days, and 2 cases could not be traced.

Malarial fevers were also of short duration. One case of remittent fever was furloughed as still sick after fifteen days. In addition to the 2 cases reported as typhoid convalescents, which were included among the

typhoid for the month of October, 3 cases of this disease were found in the First Division Hospital, not accounted for by the regimental surgeon. These occurred during the first week in December.

A brief review of the medical history of this regiment will therefore show that the health of the men from the 20th of May, the time of muster in, till about the 10th of July was very good, although the regiment had occupied for nearly six weeks of this time an unsuitable camp site at Camp Cuba Libre, Fla. Simple diarrheas and mild fevers, of supposed malarial origin, occurred in small numbers during this time. No typhoid fever occurred up to this date. Hence this disease was not brought with the regiment to Camp Cuba Libre. During the latter half of July some of the cases of diarrhea and malaria, still few in number, showed a more protracted duration, but suspicion was not aroused as to the character of the fevers until a death having occurred on August 8 of a patient sent to hospital five days before, and the lesions of typhoid fever having been disclosed, it was then ascertained that 1 case admitted to sick report July 11, 2 cases on July 13, and 1 on July 24 were cases of typhoid fever. Indeed, the diagnosis of a case of diarrhea admitted on July 26, but not sent to hospital till August 16, was also changed to typhoid fever. In other words, typhoid fever began in this regiment prior to the middle of July, but was not recognized as such till August 8, nearly one month later. Nor would it have been recognized at that date had not a case terminated fatally. The disease made but little progress during the latter half of July and the first half of August, only 9 cases having been diagnosed as such during this period (July 11 to August 15). During this same period there were also treated in quarters 9 cases of protracted diarrhea and 9 cases of prolonged malarial disease, cases diagnosed as intermittent, remittent, and continued fever.

The regiment having now changed its camp site to higher ground we observe that diarrhea, supposed malarial diseases, and typhoid fever all increase markedly during the latter half of August. It should be stated, however, that at the time of our inspection of this regiment's camp early in September the regimental surgeon was not willing to admit the existence, even at that time, of more than 1 case of typhoid fever, viz, the fatal case. All other cases of fever, both in hospital and quarters, were considered to be of malarial character. Thirty cases then undergoing treatment in the Third Division Hospital were all pronounced by the regimental surgeon to be cases of malaria, when in reality 24 of these cases had already been diagnosed as typhoid fever by the physicians of the hospital.

This fact would seem to be very strongly suggestive of the typhoidal character of many of the supposed malarial fevers which were treated in quarters, as well as of some of the cases of diarrhea. That the curve of these three diseases should have rapidly risen during the latter half of August appears to be something more

than a simple coincidence. We believe that the same cause was largely responsible for the simultaneous increase of the three classes of cases, viz, typhoidal infection. By the end of August the disease had obtained a good foothold in the new camp, 17 cases having occurred during the last week of this month. It is a matter of surprise that so soon after the removal of the regiment from Jacksonville to Panama Park typhoid should have developed. This is probably to be accounted for by the presence of sources of infection, not only in its own camp, but also in the immediate vicinity, such as the camp of the First South Carolina and the wards of the Third Division Hospital, where cases of typhoid fever had been under treatment since July 20. During September the disease rapidly increased, the number of cases for this month reaching 157, divided as follows: First week 27, second week 27, third week 55, fourth week 44, with 3 additional cases for the last three days of the month. The number of the cases occurring in individual companies varies considerably, Company B having 5 cases, against 24 cases in Company D.

With the removal of the regiment to Jacksonville on September 28, we observe a marked reduction in the number of cases for October, with an almost complete suppression of the disease after October 19. While this reduction was largely influenced by the removal of the regiment, it can not be wholly attributed to that, since we find that the decrease in the number of cases begins with the first week in October, too soon to have been brought about by the change of camp. We believe that much of the reduction in cases should be attributed to the strenuous efforts put forth during September for the general sanitary improvement of the camp. With the end of October, typhoid fever ceased to be a disturbing factor in this regiment, only 6 cases occurring in November and 3 cases in December.

Total cases (July 11 to December 31), 238.

Total deaths:

Typhoid, so called	20
Uncertain causes	4
<hr/>	
Typhoid fever (probable)	24
Other diseases	1
<hr/>	
All diseases	25

Mortality per cent of certain typhoid, so called, and probable typhoid, 8.43 (20 deaths); 10.12 (24 deaths).

In the first case (20 deaths), typhoid deaths 80 per cent of all deaths.

In the second case (24 deaths), typhoid deaths 96 per cent of all deaths.

FIRST SOUTH CAROLINA VOLUNTEER INFANTRY.

ABSTRACT OF SURGEON'S STATEMENT.

[First Lieut. John M. Lawson, assistant surgeon, U. S. Volunteers.]

This regiment was mustered in at Camp Ellerbe, Columbia, S. C. The enlisted men began to arrive May 3, 1898, but the full quota was not obtained until the last of the month. The camp site was about 2

miles from Columbia. Water was obtained from a spring, and was pumped to the camp by an engine. The supply was only enough for drinking and cooking purposes. There were no bathing facilities. Ordinary sinks were dug for the reception of fecal matter, which was covered morning and night. The tentage supplied was very poor at first, but was changed while at Camp Ellerbe for A tents. Four or five men occupied a tent, the men sleeping on the ground.

With the exception of 1 fatal case of pneumonia there was no serious sickness at Camp Ellerbe. There were cases of diarrhea and mild dysentery, attributed to change of food and habits. Some of these affections of the bowels were very prostrating. A few men were on this account left behind when the regiment abandoned their first camp. One of these cases afterwards terminated fatally, about two weeks after the regiment's departure, but as to the exact diagnosis in this case Lieutenant Lawson was unable to determine. No case of typhoid fever occurred while at Camp Ellerbe.

The regiment left Columbia, S. C., during the first week in June. Arriving at Camp Thomas, Chickamauga Park, Ga., on June 7, it was assigned to the First Brigade, Third Division, First Army Corps, and encamped between the Twelfth Minnesota and the Ninth Pennsylvania. This camp site was sloping, with fair drainage, but very damp at night. During the first part of their stay at Camp Thomas the men used the water from the driven wells; but this was changed after a few weeks for spring water, which was hauled in barrels from Blue Spring and Crawfish Spring. Some attempt was made to use boiled water, but practically the men drank unboiled water. It appears that the water of the driven wells was abandoned, partly because at times it was turbid and partly because the supply was insufficient. Sinks were dug for the reception of fecal matter to the north of the camp and at first about 150 feet distant. As new sinks were needed they were farther removed, till at last they were 500 feet distant from the mess tents. These sinks were dug to a depth of 6 feet, but the labor of making them was great, owing to the hard clay and the strata of rock met with. Their contents were covered twice a day. This could be accomplished during the first three weeks of the Chickamauga encampment, as the weather was exceedingly dry. When the rainy season began in July it was impossible to keep the contents of the sinks properly covered, although during the first part of the regiment's stay at this camp each soldier was ordered to cover his own stool. According to Lieutenant Lawson, diarrhea perceptibly diminished after the regiment arrived at Chickamauga. Typhoid fever appeared about three weeks after arrival at Camp Thomas. As to the number of cases of this disease among the fever cases sent to division hospital, 15 to 20 in number, Lieutenant Lawson could not positively state. He had held, with other surgeons, that the majority of these cases were malarial in character. Three of these cases

proved fatal. These he considered to be cases of typhoid fever. Some of the fever cases sent to division hospital yielded, within four or five days, to quinine, which was proof positive, in Lieutenant Lawson's opinion, of their malarial character.

REMARKS BY THE BOARD.

As the First South Carolina Infantry remained at Camp Thomas, Chickamauga Park, practically all of June and July, it will be first necessary to study its medical history at this camp.

For the month of May we find 1 admission to sick report, viz, private J. A. B., Company L, First South Carolina; diagnosis, typhoid fever.^a He was sent to his home May 31, 1898, where he afterwards died.

The regiment reached Camp Thomas on June 7. Average strength for June, 1,000 officers and men; total admissions for all diseases, 259. Surg. J. A. Wood, regimental surgeon, states that there has been during June (this regiment at Chickamauga Park June 7) an unusual number of cases of acute diarrhea and dysentery, caused by the impure water at Camp Ellerbe, S. C., as well as due to imprudence in diet. He also calls attention to the occurrence of cases of intermittent and remittent fevers at Chickamauga Park, adding that these types of fever are not always well marked. "Remittents of one day's duration are so called by reason of absence of cold-sweating stage, and the length of the fever, usually twelve to twenty-four hours." He further remarks that some cases sent to the division hospital have assumed a continued type and have subsequently been pronounced typhoid fever.

The admissions for the period June 18, when the record begins, to June 30 were 259, divided as follows: Acute diarrhea, 132; acute dysentery, 8; intermittent fever, tertian, 52; remittent fever, 9; fever undetermined, 7; typhoid fever, none; all other causes, 51.

The cases of dysentery were mild in character and returned to duty within five to ten days. The duration of the 132 cases of diarrhea were as follows: One to three days, 113; four to six days, 16; thirteen days, 1; nineteen days, 1; twenty-one days, 1. The cases of longest duration were admitted during the last week in June. The cases of nineteen and twenty-one days' duration were sent to division hospital, where the diagnosis was changed in one case, a private of Company H, admitted June 27, to remittent fever.

Of the cases of tertian intermittent, 43 were treated in quarters, and were of the following duration: One day, 16; two days, 15; three days, 3; five to seven days, 9. Seven cases were sent to division hospital, and were returned to duty, diagnosis unchanged, after the following length of stay in the hospital: Four days, 1; eight days, 1; nine days, 1; eleven days, 1; sixteen days, 1;

twenty-eight days, 1; thirty-five days, 1. Two cases were transferred to general hospital and were changed to the diagnosis of typhoid fever.

Of the 9 cases diagnosed as remittent fever, 8 cases were treated in quarters and were from one to five days in duration. One was transferred to hospital and returned to duty after nineteen days.

The 7 cases of fever undetermined were sent to hospital. Of these, 3 were returned to duty with diagnosis of diarrhea after two to seven days; 3 were changed to typhoid fever in the division hospital, and 1 was sent to a private hospital and could not be traced.

The cases diagnosed in hospital as typhoid fever were admitted on June 22, 23, 24, 29, and 30, and belonged to Companies A, H, K, and M (2 cases).

In this connection, we note that the cases of supposed intermittent and remittent fever of protracted duration were admitted during the last week in June and at the time when cases of typhoid fever were also occurring. Typhoid fever, therefore, appeared in this regiment fifteen days after arrival at Camp George H. Thomas. The disease, however, does not appear to have been brought to the camp by the First South Carolina Infantry.

Concerning the July sick and wounded report, Major Wood remarks:

The diseases most prevalent in the regiment were of malarial origin. An autopsy was made on the body of Private S. F. C., Company F, July 19, who died of general peritonitis somewhat suddenly, having been on sick report less than twenty-four hours. A quantity of pus and fecal matter was found in the peritoneal cavity and 2 perforations, 3 inches apart, were discovered in the jejunum about 5 feet below duodenum. The man was just recovering from a drunken debauch when taken ill.

During the month, with an average strength of 1,154 men, there were 520 admissions to sick report, divided as follows: Acute diarrhea, 70; acute dysentery, 91; intermittent fever, tertian, 39; remittent fever, 159; undetermined fever, 9; typhoid fever, none; all other causes, 148. Measles prevailed during July.

Of the 161 cases of intestinal disorder, 114 were of one day's duration, 40 from two to seven days, and 7 from eight to thirteen days.

Evidently the term "acute dysentery" was not appropriate for the cases so diagnosed.

Of the 39 cases of tertian intermittent, 36 were treated in quarters and were of the following duration: One to three days, 31; seven to eleven days, 5. Three cases were transferred to hospital after seven, eleven, and twenty days' treatment in quarters. The diagnosis was changed in 1 case (fatal) to typhoid fever; the other 2 could not be traced.

One hundred and forty-two cases of remittent fever were treated in quarters and were of the following duration: One to three days, 121; four to seven days, 13; eight to 11 days, 7; sixteen days, 1.

Seventeen cases were sent to the hospital, with the

^a This case not charted.

following result: Three returned to the regiment, diagnosis unchanged, after ten, twenty-four, and twenty-six days' treatment; 1 furloughed after fifty-seven days, diagnosis unchanged; 3 changed to typhoid fever, and 10 cases could not be traced.

Nine cases of undetermined fever were sent to hospital. Of these, 7 were returned to duty, with the diagnosis changed to remittent fever, after the following stay in the hospital: One day, 1; ten days, 1; sixteen days, 2; eighteen days, 2; twenty-three days, 1. Two cases were changed to the diagnosis of typhoid fever.

We also find in the Leiter General Hospital 3 cases of typhoid fever admitted during July, and in the McPherson General Hospital 1 case from the First South Carolina Infantry which was not accounted for by the regimental surgeon.

We thus observe that, although the regimental medical officers had not recognized the presence of typhoid fever, not less than 10 cases of this disease, 1 of which proved fatal, had occurred prior to the departure of the regiment from Chickamauga Park on July 29, 1898. The case of the private of Company F who died of intestinal perforation on July 19 would also appear to belong to the typhoid infections.

The following are the cases of typhoid fever, by company and date of occurrence, for the month of July: July 1, Company L; 2, Company A; 8, Company F; Company I, Company H, Company K; 19, Company M; 23, Company G; 20, Company M; 19, Company F, 1 case each; to which should be added 1 case occurring in Company D on July 31, the day following the regiment's arrival at Jacksonville, Fla.

The following is a continuation of the abstract of the medical officer's statement: The regiment left Chickamauga Park on the 29th day of July, arriving at Camp Cuba Libre, Fla., July 30, 1898. It was assigned to the Third Division, Seventh Army Corps, and placed in camp at Panama Park, Fla., on a hill about 400 yards east of the Third Division Hospital. Its water was piped from artesian wells and its fecal material deposited in pits, located about 75 to 100 yards from the mess tents. At one time these sinks were about 60 feet nearer the kitchen; but as it was found impossible to dig them deeper than $3\frac{1}{2}$ feet without striking water, they were moved back on higher ground, which put them on a higher level than some of the company streets.

The contents of sinks were covered daily with earth and lime. Each man was supposed to cover his own excrement.

The principal diseases which have occurred during August at Camp Cuba Libre, according to Lieutenant Lawson, have been intermittent and remittent fevers and diarrhea. He did not believe that any case of typhoid fever had occurred in the regiment since arrival at Panama Park except the case of Captain M., of Company A, which occurred August 18. Of 30 or

35 cases of fever which were in the division hospital, none were considered to be typhoid fever.

There has been a good deal of diarrhea since arrival at Panama Park, not of a severe type as far as life is concerned, but very prostrating. Although the regiment had a canteen at Camp Thomas, it has had none here. There were some shacks near the regiment, but these have been removed. The nearest regiment to the First South Carolina is the Fourth Illinois, whose sinks are some 200 yards distant. The men have slept on the ground since their arrival, but the tents are now being floored.

The regiment being established in its new camp at Panama Park on the 1st of August, we find for this month, in an average strength of 1,220 officers and men, 587 admissions to the sick list, as follows: Acute diarrhea, 112; acute dysentery, 118; intermittent fever, 6; remittent fever, 121; undetermined fever, 26; typhoid fever, 1; all other causes, 203.

A careful study of the intestinal disorders shows that, as a rule, these were of mild character. Of 230 cases, 142 were returned to duty at the end of twenty-four hours; 56 lasted two to three days, and 14 were from four to seven days in duration. So that only 16 cases of diarrhea or dysentery lasted more than seven days. Of these, 10 were treated in company quarters and were returned to duty after seven to twenty days' treatment. Six only were transferred to hospital; of these, 3 were returned to the regiment within twenty days with diagnosis unchanged, while in 3 cases the diagnosis was changed to typhoid fever.

Of the 6 cases of intermittent fever, 5 were treated in quarters and were of the following duration: One day, 2; thirteen days, 1; seventeen days, 1; twenty-four days, 1. One was sent to division hospital where the diagnosis was changed to typhoid fever.

Of the 121 cases of fevers diagnosed as remittent malarial, 85 cases were of less than three days' duration, leaving 36 cases which required treatment for one or more weeks. Of these, 17 were treated in quarters, duration seven days, 4; eight to thirteen days, 7; fifteen days, 1; eighteen days, 1; twenty-nine days, 1; thirty days, 2; fifty days, 1.

Nineteen were transferred to hospital, of whom 5 were returned to duty, diagnosis unchanged after seven, nineteen, twenty-nine, and thirty-three days, and in 14 cases the diagnosis was changed to typhoid fever.

Of the undetermined fevers 15 were treated in quarters, lasting from one to seven days, and 11 were sent to hospital. Six of these were returned after eleven, nineteen, twenty-eight, twenty-nine, thirty-three, and thirty-eight days, diagnosis unchanged, and in 4 cases the diagnosis was changed to typhoid fever. So that in estimating the prevalence of typhoid fever in this regiment for August we must add to the 1 case reported by the surgeon 22 cases in which the diagnosis was changed from acute diarrhea, intermittent, remittent, and unde-

terminated fevers. The chart of this regiment gives the dates of occurrence of these cases.

In addition to these 23 cases of typhoid fever there occurred during August 15 cases of supposed malarial infections which were from fifteen to thirty-eight days under treatment.

We note that 5 cases of typhoid fever were admitted to sick report between July 31 and August 6, and hence these cases were imported by the First South Carolina into its new camp at Panama Park, Fla.

For the month of September we find in an average strength of 1,269 officers and men 502 admissions to sick report, as follows: Acute diarrhea, 37; acute dysentery, 130; remittent fever, 77; undetermined fever, 111; typhoid fever, 3; all other causes, 144.

Of the 167 cases of intestinal disorders 139 were returned to duty within three days. Only 6 cases of acute dysentery lasted longer than one week. All cases were treated in quarters, except 1 sent to a private hospital, of which no further record could be found. No case appears to have been confounded with the early stage of typhoid infection.

Forty-five cases of remittent fever were of less than three days in duration; 16 cases lasted from four to seven days; 16 cases lasted more than seven days, of which 15 were treated in quarters and 1 transferred to hospital. The cases treated in quarters were of the following duration: Eight days, 2; nine days, 2; ten to thirteen days, 7; sixteen to twenty-six days, 4. The case transferred to hospital was changed to the diagnosis of typhoid fever.

Ninety-one cases of undetermined fever treated in quarters were of the following duration: One to three days, 66; four to six days, 17; eight to thirteen days, 6; eighteen days, 2.

Twenty cases were transferred to hospital, of which 5 were returned to the regiment after nine, twelve, thirteen, eighteen, and twenty-one days with diagnosis changed to remittent fever. One was furloughed after fifteen days as remittent fever, and in 12 cases the diagnosis was changed to typhoid fever. Two cases were not traced. Thus we find altogether 16 cases of typhoid fever for the month of September.

The case of Maj. Julius A. Mood, regimental surgeon, is also admitted for September 13, but as a typhoid convalescent, so that his case would properly belong to the admissions for August.

We note that no case was admitted after September 23. The following day the regiment broke camp for Columbia, S. C., at which point it was subsequently mustered out of service. No further records are available.^a

The number of cases of typhoid fever both for August and September is quite small as compared with other regiments of the Third Division, Seventh Corps.

We also observe that the number of cases of supposed malarial diseases lasting ten or more days is correspondingly small, although the conditions appeared to be just as favorable for their development as in other regiments in this division.

SECOND UNITED STATES VOLUNTEER CAVALRY.

ABSTRACT OF ACTING SURGEON'S STATEMENT.

[First Lieut. Matthew R. Root, assistant surgeon, U. S. Volunteers.]

This regiment was mustered into service on the 6th day of May, 1898, at Fort D. A. Russell, Wyo. The men were quartered in the Regular Army barracks, with the exception of two troops, which were camped near and were provided with Sibley wall tents. These two troops made use of pits dug in the ground for the disposal of excreta, the other companies using the water-closets attached to the post barracks. The water supply was taken from a creek which furnished the Government supply. While encamped at this post, from May 6 to June 22, there was no sickness of any importance. No cases of typhoid fever occurred. Leaving Fort Russell June 22, the regiment came directly to Jacksonville, Fla., arriving June 28, and went into camp at Panama Park, being assigned to the Third Division, Seventh Army Corps. The site of the camp was well drained and was near that of the Second Mississippi Volunteer Infantry. An abundant water supply, obtained from artesian wells, had already been provided. Pits were dug for the reception of excreta. These sinks were located at a distance of about 150 feet from the mess tents. At first dry earth was thrown into the pits two or three times daily, but for several weeks each soldier has been required to cover his own excrement. Since reaching Panama Park the prevailing disease has been acute diarrhea, and occasionally a case resembling acute dysentery, with bloody stools. This disease was attributed to change of water and climate. As regards the presence of typhoid fever, the surgeon stated that no case of this disease appeared until about the 10th of August. Previous to this time there had been a few cases of fever, which yielded to quinine. He could not positively give the number of cases of typhoid fever which had occurred during the month of August. At the time his testimony was given (September 8) there were about 35 cases of fever under treatment in the division hospital, and a good many of these were called typhoid fever by the hospital surgeons. Although he was willing to admit that many of these fevers resembled typhoid fever, yet they were not typical examples of that disease. He thought that the term "typhomalarial" could be applied to these fevers, but he preferred to designate them "continued fever." He had observed no cases of an intermittent type. Some of these cases of so-called continued malarial fever lasted only about ten days; others were of longer duration, and

^a The chart shows admissions up to Oct. 9

these he considered to be typho-malarial fevers. Men developing fever were allowed to remain for two or three days in their individual tents. If the case did not yield to liberal doses of quinine, the soldier was, at the expiration of this time, transferred to the division hospital. Many of these cases of fever had diarrhea also, but no other measure of disinfection of the stools was taken than the daily use of lime in the company sinks. The men occupy A tents, from two to four soldiers to a tent. The tents have all been floored. As regards the origin of typhoid fever among the men of this regiment, Lieutenant Root had thought that it might have been contracted from adjoining regiments having typhoid fever, by means of flies. The sinks of the Second Mississippi Volunteer Infantry were about 200 yards distant. He thought that some importance might be attached to the joint use of a canteen with the Second Mississippi. He attributed some importance also to shallow wells in private yards near the regiment camp site. Several cases of typhoid fever had occurred among soldiers who were in the habit of visiting a private house close to the camp.

REMARKS BY THE BOARD.

Examination of all available records and reports shows that for the month of June, in an average strength of 41 officers and 955 enlisted men, there were only 45 admissions to sick report, 15 of which were for wounds and injuries received in a railroad wreck on June 26. Acute bronchial affections contributed the majority of the admissions. There were no intestinal disorders and no fevers of any description.

The regiment having arrived in its Florida camp on June 28, we find one month later the following statement on the July report of sick by Major Jessurun, regimental surgeon: "With the exception of diarrhea, there has been practically no disease in the command. The prevalent form of diarrhea does not appear to be due to either water or food, and can not properly be attributed to indiscretion in either eating or drinking, as the disease has been observed among the most intelligent and reliable men, who have been most careful. All known remedies at hand have been intelligently used and results have been practically nil." The diarrhea was attributed to climatic conditions and excessive exercise at mounted drill during hot weather.

Average strength for July: Officers, 39; enlisted men, 919. Admissions for all causes, 324, divided as follows: Acute diarrhea, 236; acute dysentery, 8; malarial remittent fever, 29; all other causes, 161.

Forty-eight cases of acute diarrhea and 4 cases of acute dysentery, all mild in character, occurred prior to July 15. During the latter half of the month, diarrheal diseases rapidly increased, amounting to 188 cases, with 4 cases of acute dysentery. Very few of these cases lasted more than seven days, and after the most careful examination of records no case appears to have developed into typhoid fever.

Of the 29 cases of malarial remittent fever, 15 were admitted during the last week in July. The duration of the remittent fevers was as follows: One day, 9; two days, 5; three days, 3; four days, 6; five days, 1; six days, 2; eight days, 1; ten days, 2; fifteen days, 1.

No cases of typhoid fever were reported by the surgeon for July, but we observe that Private A. D. H., Troop B, admitted on July 30 as a case of remittent malarial fever and returned to duty July 31, was readmitted on August 5, transferred to Third Division Hospital on August 6, and there pronounced to be a case of typhoid fever. With the exception above indicated, the fevers for July were mild in character, only one case of typhoid fever having occurred.

The surgeon states that during August the prevailing diseases have been typhoid fever, remittent malarias, and acute diarrhea. In an average strength of 44 officers and 961 enlisted men, there were 171 admissions to sick report, divided as follows: Acute diarrhea, 88; malarial fever, remittent, 57; undetermined fever, 1; typhoid fever, 5; all other causes, 28. These figures are taken from the regimental report.

Of the acute diarrheas, 86 were treated in quarters by the regimental surgeon, and were of the following duration: One to four days, 43; five to seven days, 14; eight to ten days, 16; eleven to thirteen days, 8; fifteen to twenty-one days, 4; 2 were changed during the following month to typhoid fever and 1 could not be traced. The case of undetermined fever was twenty-six days later discharged for varicocele.

Of the 57 cases of remittent fever, 25 were treated in quarters and were of the following duration: One day, 6; two days, 3; four days, 1; five days, 1; six days, 2; seven days, 2; eight days, 2; nine days, 2; twelve days, 2; twenty-one days, 1; twenty-five days, 1; twenty-nine days, 1, and one changed to typhoid fever. Thirty-two cases were sent to the division hospital. Of these, 8 were returned to the regiment, diagnosis unchanged, after treatment, as follows: Five days, 2; nine days, 1; ten days, 2; twelve days, 1; fourteen days, 1; twenty-two days, 1, and 3 cases were remaining in hospital at the end of sixty-one days, diagnosis unchanged. In the remaining 21 cases the diagnosis was changed to typhoid fever.

We find that the more protracted diarrheas occurred after the 10th of August, and that at this time the supposed malaria fevers increased in number and duration, and not yielding to quinine, necessitated transfer to hospital, where, as we have already seen, many of them were found to be cases of typhoid fever. Of the 5 cases of typhoid fever diagnosed by the regimental surgeon, we have already pointed out that 1 case began on July 30, and hence should be omitted in calculating this disease for August. To these 4 remaining cases, there should be added 23 cases (diarrhea, 2; remittent fever, 21) changed to typhoid fever. We have also found among the August admissions to the Third Division

Hospital 10 other cases of typhoid fever belonging to the Second United States Volunteer Cavalry, but which were not accounted for on the regimental report. (See chart for August.)

Surgeon Jessurun states on the September report of sick and wounded that the prevailing diseases have been typhoid fever, acute diarrhea, and a form of malarial remittent fever of atypical character. He also says that the diarrheas were very obstinate, not being controlled by medication.

For this month, in an average strength of 796 officers and men, we find 426 admissions, divided as follows: Acute diarrhea, 180; remittent fever, 145; typhoid fever, 63; all other causes, 38.

One hundred and seventy-eight cases of diarrhea were treated by the regimental surgeon in quarters and were of the following duration: One day, 50; two days, 60; three to six days, 51; seven to fourteen days, 7; fifteen to twenty-five days, 5, and 5 cases changed to typhoid fever. Two cases of acute diarrhea were sent to the division hospital where one was changed to typhoid fever.

Of the 145 cases of remittent fever, 129 were treated in quarters of which the duration was: Two days, 8; three days, 12; four days, 12; five days, 15; six days, 6; seven days, 5; eight days, 6; nine days, 3; ten days, 3; twelve to fifteen days, 7; sixteen to twenty days, 5; twenty-two to thirty days, 4; thirty-one to fifty days, 43. Sixteen were sent to division hospital, of which 5 were changed to typhoid and 5 furloughed after thirteen to thirty days' treatment, diagnosis unchanged, and 6 could not be traced.

Of the 63 cases of typhoid fever diagnosed by the surgeon and transferred to the division hospital the diagnosis in 5 cases was changed to remittent fever, the patients being returned to duty in six to nine days; in 3 it was changed to intermittent fever and returned to duty in five days; 4 to diarrhea and to duty in two days, and 1 "wound" and to duty in seven days, thus reducing the cases of typhoid fever to 50. To these should be added 5 cases of remittent fever in which the diagnosis was changed to typhoid fever at the division hospital, and 1 case of acute diarrhea changed to typhoid as indicated above, making a total of 56 cases.

In estimating the prevalence of typhoid fever in this regiment for September we must bear in mind that in addition to the 56 cases diagnosed as such, there were not less than 56 cases diagnosed as remittent malarial fever of "atypical character," to quote the surgeon's words, which were under treatment in the regimental hospital for periods varying from ten to fifty days, many of these being still sick on October 20, 1898, when the last report was submitted by the surgeon. An examination of the dates of occurrence of these cases strengthens the belief that they were probably typhoid infections. It is noticeable that nearly all cases, whether diarrheal or malarial, were treated in the regimental

hospital, few being transferred to the division hospital, so that a correction of diagnosis was not possible in their cases. We shall have occasion to refer, in another part of this report, to the result of the blood examination of selected malarial cases in the Second U. S. Volunteer Cavalry.

The strength of the regiment for October is not given. The admissions numbered 35, divided as follows: Typhoid fever, 30; undetermined fever, 1; other causes, 4.

The case of undetermined fever and a case of diarrhea were changed to typhoid fever in the Third Division Hospital. In addition to the cases reported by the regimental surgeon there were found in the Third Division Hospital the following: Remittent fever, 5 cases; duration three to seven days; typhoid fever, 20 cases. Thus the cases of typhoid fever for October numbered 52.

It is important to observe that the 13 cases admitted between September 16 and 21 were among the cases found in the division hospital and not accounted for by the regimental surgeon. The date of the commencement of the attack in these cases probably antedated the hospital admission by several days. With this correction made, there is observed a sudden and surprising reduction in typhoid cases about the middle of this month.

It is also important to note that while the conditions of season and temperature were favorable to the occurrence of malarial remittents, the surgeon reports no cases of this disease for October.

Reviewing the occurrence of typhoid fever in this regiment, it would appear that the Second U. S. Volunteer Cavalry, arriving at Panama Park, Fla., June 28, 1898, did not import any cases of typhoid fever into its new camp, and remained free from this disease for a period of about four and one-half weeks, notwithstanding its proximity to the Second Mississippi Volunteer Infantry, already infected with the disease. At the expiration of this time suspicious cases, few in number, of diarrhea and supposed malarial remittents, of prolonged duration, began to appear. Some of these were a little later found to be cases of typhoid fever. On July 30, 1898, the first case to occur was admitted as acute diarrhea, and returned to duty on August 1, readmitted four days later as malarial remittent fever, and transferred to division hospital on August 7, where the case was later recognized as one of typhoid fever. By the end of the first week in August 4 unmistakable cases of the disease had been admitted to hospital. From this time the disease progressed slowly but steadily, there being 37 admissions for the month. This number, however, fails to include cases of supposed malarial remittents lasting from fourteen to sixty-one days, which were admitted from time to time during the month.

During September diarrheal disorders, supposed ma-

larial diseases, and typhoid fever all markedly increased, the latter disease rising to 56 cases for the month. This number includes 5 cases of diarrhea and 5 cases of remittent fever recognized at the division hospital as typhoid fever, but it does not include protracted diarrheas, some of which were probably cases of typhoid fever, nor does it cover 56 cases of prolonged remittents, many of which were certainly cases of that disease. Could an accurate diagnosis have been made in these cases we believe that the cases of typhoid fever for September would have numbered approximately 120. It is noticeable that there is a marked diminution in the cases between the 21st and 30th of September and a corresponding reduction in supposed malarial diseases. Turning to the next month, we find 52 cases of typhoid fever recorded, all of which, for reasons already stated, we would place in the first half of October. We thus observe that, without change of camp site, both typhoid fever and supposed malarial diseases undergo a marked and abrupt diminution, amounting almost to a cessation of cases by the 25th of October. The regiment left Panama Park, Fla., October 24 for muster out.

THIRD NEBRASKA VOLUNTEER INFANTRY.

ABSTRACT OF REGIMENTAL SURGEON'S STATEMENT.

[Maj. O. Grothian, U. S. Volunteers.]

The Third Nebraska Volunteer Infantry was mustered into service at old Fort Omaha, Nebr. The companies had been arriving at this rendezvous since June 20, but the full regiment was not present till July 13, 1898. At this camp, 4 miles distant from the city of Omaha, the water was obtained from the general supply of that city. Dry-earth closets belonging to the old army garrison were used for the disposal of excreta, a small amount of earth being thrown into these boxes from time to time. There was very little sickness at this camp—some cases of diarrhea and two cases of fever which were at first looked upon as cases of typhoid fever; but these cases were of short duration, leading the surgeon to believe that he had been mistaken in the diagnosis.

The regiment left Omaha on July 18 and came direct to Jacksonville, arriving July 22, 1898. It was given a good site at Panama Park, Fla., near the camp of the Second U. S. Volunteer Cavalry, and assigned to the Third Division, Seventh Army Corps. The water supply was piped from deep artesian wells. Pits for excreta were dug at a distance of 40 yards from the mess tents. Dry earth was thrown into these pits three times a day by the regular detail for that purpose. Soon after arrival there was a good deal of diarrhea, but this has largely subsided. About 20 cases of measles have occurred. Typhoid fever appeared about three weeks after pitching camp at Panama Park. There have been about 53 cases of this disease, including the

month of August, and quite a number of malarial fevers, all of these of remittent type, not commencing with a chill, but frequently with some irritability of the stomach and vomiting. These cases of remittent character frequently return to duty in about ten days. The men of the Third Nebraska come from a section of the country where malarial diseases do not prevail. The cases of typhoid fever and malarial remittent have not affected any one company more than the others. Whether cases which have begun as remittent fevers have afterwards changed to the continued type could not be stated, as they pass from the regimental surgeon's observation after reaching the division hospital. As to the origin of typhoid fever in the Third Nebraska, Major Grothian was of opinion that the possible sources were two, viz, the danger from the consumption of ice cream, milk shakes, lemonade, etc., sold by irresponsible vendors, and the proximity to the Second Mississippi Infantry, which had many cases of typhoid fever. The sinks of the latter regiment were only about 100 yards distant from certain tents of the Third Nebraska, and there was the possible danger of transmission of the disease by flies.

REMARKS BY THE BOARD.

Examination of the regimental report of sick and wounded for July shows that there were 201 admissions from all causes, as follows: Acute diarrhea, 136; intermittent fever, 8; typhoid fever, 2; all other causes, 55.

One hundred and thirty-five cases of diarrhea occurred during the last week in July, following the arrival of the troops at Jacksonville. The disease appears to have affected all companies, but is mild in character, as a rule lasting twenty-four hours.

Of the 8 cases of intermittent fever 3 occurred at Fort Omaha, Nebr., lasting five days in one case and two days in each of the others. Of those occurring in Florida the duration was as follows: Two days, 1; seven days, 1; eight days, 1; nine days, 1; twelve days, 1. Owing to the absence of malarial fevers in Nebraska, the milder cases of these supposed intermittents were probably febrile disturbances due to intestinal causes. In one instance the attack began one week after arrival in Florida and was considered to be an intermittent fever, but on the eighth day of the disease the diagnosis was changed to acute dysentery, the soldier being treated in quarters by the regimental surgeon until the 7th day of September.

Two cases of typhoid fever were reported by the surgeon prior to the departure of the regiment from Nebraska—one private, C. A. A., Company D, admitted July 10 and transferred to Fort Crook, Nebr., July 14; the second, Sergeant P., Company A, admitted July 18 and sent to his home the same day. As this soldier is again admitted on July 25 for diarrhea and returned to duty on July 29, and again admitted for diarrhea on August 29 and returned to duty September 8, the first diagnosis must remain doubtful. With regard to the

supposed case of typhoid fever admitted July 10 and transferred to the military hospital at Fort Crook, Nebr., July 14, this patient must have been returned to duty with his regiment prior to the end of August, as we again find him admitted to sick report by the surgeon as a case of "acute diarrhea complicated with remittent malarial fever" on August 29 and transferred September 1 to the Third Division Hospital, where the diagnosis of typhoid fever was made, the case remaining under treatment till October 4. This information would seem to preclude the typhoidal character of the first attack.

A careful examination of all the evidence attainable would point, nevertheless, to the importation by the Third Nebraska into its Florida camp of at least one case of typhoid fever. This case was admitted to sick report in the person of a private of Company D on July 26 (four days after arrival) as a case of acute diarrhea and treated as such in quarters till August 25, on which date the case was transferred to the Third Division Hospital and there pronounced to be a case of typhoid fever. There is one other case to which the suspicion of infection prior to the departure of the regiment from its State camp is strongly attached, viz, Corporal M. G., Company H. This soldier, who was admitted to sick report on July 31 as a case of "acute diarrhea" and returned to duty August 2 was again admitted August 4, under diagnosis of "acute cardialgia," and returned to duty August 6; was again admitted on August 8 and transferred to the division hospital on the same date, where the diagnosis was changed from acute cardialgia to typhoid fever.

The following is taken from the regimental surgeon's remarks on the sick and wounded report for August:

Malarial fever of remittent type has prevailed to a considerable extent during the latter half of this month. The disease responds readily to appropriate remedies. About 16 cases of typhoid fever occurred during the month. These were well distributed over the camp, showing that there is no local focus of infection. All ordinary precautions have been recommended and fairly well carried out, as immediate covering of fecal deposits by each individual, the use of lime in sinks, boiling of eating utensils twice a week, keeping dishes and rations out of the way of flies, scalding out water barrels, etc. The medical department has endeavored to prevent the men from eating and drinking anything from wagons and venders; but this is almost impossible and may account for some of the typhoid-fever cases. Typhoid fever existed in an adjoining camp at the time of the regiment's arrival here, and some cases may possibly have been infected from this source through the medium of flies.

During the month of August we find a marked increase in the sick rate. The admissions to sick report in an average strength of 1,289 were 410, divided as follows: Acute diarrhea, 215; acute dysentery, 4; quotidian intermittent fever, 52; remittent fever, 23; typhoid fever, 15; all other causes and injuries, 101.

The duration of the 213 cases of diarrhea treated in quarters was as follows: One day, 102; two days, 46; three days, 23; four days, 15; five days, 6; six days, 4; seven days, 3; eight days, 2; nine days, 2; ten days, 3; twelve days, 1; fourteen days, 1; sixteen days, 1;

twenty-three days, 1; twenty-four days, 2; twenty-five days, 1; thirty days, 1; thirty-five days, 1.

Two only were sent to hospital after being under treatment in quarters twenty-four and thirty-five days, respectively. In the latter case the diagnosis was changed to typhoid fever at the Third Division Hospital; the former was transferred to the Pablo Beach Hospital and could not be further traced. Whether other of the more protracted cases of diarrhea were due to typhoid infection can not possibly be determined. The duration of the 4 cases of acute dysentery was one, eight, fourteen, and twenty-eight days, respectively.

Of the 52 cases of quotidian intermittent fever 16 were treated in quarters and were of the following duration: Two days, 5; three days, 4; six days, 2; seven days, 1; nine days, 3; twelve days, 1. Thirty-six cases were transferred to the Third Division Hospital; of these there were returned to duty with the regiment, diagnosis unchanged, at the end of nine days, 2; sixteen days, 1; twenty-six days, 1; thirty days, 2; thirty-six days, 1; 1 was returned to duty at the end of forty-one days, diagnosis changed to diarrhea, and 1 furloughed at the end of three days, diagnosis unchanged. In 27 cases the diagnosis was changed from quotidian intermittent to that of typhoid fever.

Ten cases of remittent fever were treated with the regiment and returned to duty as follows: One day, 1; two days, 1; four days, 1; five days, 1; six days, 1; seven days, 1; ten days, 1; eighteen days, 1; twenty-one days, 1; twenty-five days, 1. Of the 13 cases under this diagnosis transferred to the division hospital, 3 were returned to the regiment at the end of ten, thirteen, and eighteen days, respectively, diagnosis unchanged; 9 cases were changed to typhoid fever, and 1 could not be traced.

In calculating the prevalence of typhoid fever in this organization for August, we must therefore add to the 15 cases reported by the regimental surgeon 29 cases of supposed intermittent fever, quotidian, and 9 cases of supposed remittent malarial fever in which the diagnosis of typhoid fever was made at the division hospital, thus increasing the cases of this disease to 53.

As the case of "acute diarrhea" changed to typhoid fever at the division hospital after thirty-five days' treatment in quarters really began during the latter part of July it is not included in the August cases. The following table gives the cases by company and date of occurrence:

Company.	Date.	Cases.
A.....	August 20, 29, 31.....	3
B.....	August 9, 29, 31.....	3
C.....	August 25.....	1
D.....	August 16, 24, 25, 29.....	4
E.....	August 23, 27, 28, 29, 31.....	5
F.....	August 20, 23, 23, 28, 28, 29, 30, 31.....	8
G.....	August 13, 22, 22, 26, 26, 28, 29, 30.....	8
H.....	August 8, 20, 31.....	3
I.....	August 11, 22, 22, 23, 25, 27, 27, 27.....	8
J.....	August 26, 29, 30, 31.....	4
K.....	August 22, 25, 30.....	3
L.....	August 28, 29, 31.....	3
M.....	August 28, 29, 31.....	3
Total.....		53

It will thus be seen that there were no cases of typhoid fever during the first week in August, but that 4 cases appeared during the second week, affecting four companies, and that the earliest cases were admitted on August 8 (Company H) and on August 9 (Company B), just seventeen days after the arrival in the Florida camp. Four cases only occurred during the third but there were 26 cases during the fourth week, and 19 additional cases for the last three days of August. Every Company was affected, some more seriously than others, the cases varying from 1 to 8 per company.

We do not believe, however, that the foregoing table expresses the full prevalence of typhoid fever in this regiment for the month of August, since we find 16 other cases of supposed malarial disease lasting from ten to forty-one days. Indeed, 12 of these cases occurring during the last week of August lasted more than twenty-four days. Six of these cases of longest duration had been treated by the medical officer under the diagnosis of quotidian intermittent fever and the remainder as cases of remittent fever. These cases were so diagnosed at a time when malarial influences were believed to be rife at Camp Cuba Libre, Fla., and when regimental surgeons were setting their faces against the diagnosis of typhoid fever. This latter diagnosis was not admitted as correct by the surgeon of the Third Nebraska in any case of fever until the death of a private of Company I in division hospital on August 27, five days after admission, showing the lesions of typhoid fever.

We would add these 16 cases of supposed malarial infection to the list of typhoids for August, thus increasing the number to 69, with 8 deaths, as far as we have been able to trace the cases.

During September the sick rate continued to be large; 384 admissions in an average strength of 1,265, divided as follows: Acute diarrhea, 38; quotidian intermittent, 18; remittent fever, 185; undetermined fever, 2; typhoid fever, 22; suspected typhoid, 59; all other causes, 60. These figures are taken from the regimental reports.

Thirty-six of the cases of acute diarrhea were treated in quarters and were of the following duration: One day, 6; two days, 13; three days, 10; four days, 5; seven days, 1; sixteen days, 1; 1 case was furloughed on the fourth day of treatment, and 1 transferred to the hospital at Pablo Beach, Fla., and could not be further traced. The diarrheas, therefore, for September were few in number and mild, except in one case, which lasted sixteen days.

Of the 18 cases of quotidian intermittent fever, 9 were treated in quarters and were of the following duration: One day, 1; two days, 2; three days, 2; four days, 2; six days, 1; seventeen days, 1.

Nine cases were treated in division hospital, of which 2 were returned to the regiment at the end of four and six days, respectively, diagnosis unchanged, and 7 were changed to the diagnosis of typhoid fever.

Of the 185 cases of remittent fever, 99 were treated in quarters by the regimental surgeon and were of the following duration: Two days, 4; three days, 5; four days, 11; five days, 7; six days, 11; seven days, 10; eight days, 8; nine days, 1; ten days, 4; eleven days, 5; twelve days, 3; thirteen days, 7; fourteen days, 2; fifteen days, 4; sixteen days, 1; seventeen days, 3; nineteen days, 3; twenty days, 1; twenty-one days, 1; twenty-three days, 3; twenty-six days, 2; thirty-one days, 1; thirty-three days, 1, and 1 could not be traced.

Eighty-six cases were sent to the hospital with the diagnosis of remittent fever, of which 13 were returned to the regiment, diagnosis unchanged, after the following duration of treatment: Two days, 3; three days, 2; five days, 1; six days, 1; nine days, 1; thirteen days, 1; eighteen days, 1; twenty-three days, 1; twenty-eight days, 1; thirty days, 1; 16 were furloughed after eleven to thirty-nine days' treatment, diagnosis unchanged; 3 could not be traced further, and 54 were changed to the diagnosis of typhoid fever. The 2 cases of "fever undetermined" were transferred to hospital and changed to the diagnosis of typhoid fever.

Thus, cases of typhoid fever for September largely exceeded those recorded for August. To the 81 cases reported as typhoid fever or suspected typhoid by the regimental surgeon in which the diagnosis was confirmed there must be added 5 cases of supposed quotidian intermittent fever, 54 cases of supposed remittent fever, and 2 cases of undetermined fever, in all of which the error of diagnosis was corrected at the division hospital. To these should be added 4 cases of typhoid fever found in the Third Division Hospital and not reported by the regimental surgeon, making a total of 146 cases for this month.

The following table shows these 146 cases by company and dates of occurrence:

Company.													Total.
September.	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	
1.....													1
2.....													6
3.....													3
4.....													8
5.....													9
6.....													13
7.....													6
8.....													4
9.....													4
10.....													6
11.....													7
12.....													7
13.....													10
14.....													2
15.....													12
16.....													12
17.....													6
18.....													5
19.....													5
20.....													4
21.....													3
22.....													4
23.....													1
24.....													3
25.....													1
26.....													2
27.....													2
28.....													0
Total...	6	13	5	23	22	8	11	11	11	11	9	13	146

This table does not include 47 cases of supposed malarial disease, intermittent and remittent, which were

under treatment for periods varying from ten to thirty-six days.

Thus, in September the number of cases of typhoid fever was nearly three times as large as during August. The disease appears to have steadily increased, reaching its highest point during the period September 10 to 20 with 70 cases, as against 60 recorded for the first ten days of September and 45 for the last ten days of August. There is still further reduction for the period September 21 to 30, during which time only 16 cases were recorded. We will find that this decrease in cases continues during the early part of October. The explanation is to be found in the removal of this regiment from its infected camp site on September 10, this having been recommended by this board as an important sanitary measure.

The regiment, having abandoned its camp site at Panama Park, Fla., on September 10 and 11 moved to a new camp at Pablo Beach, Fla. The following is the record for October in a total strength of 1,178: Total admissions, 132, divided as follows: Remittent fever, 80; typhoid fever, 25; all other diseases, 27. No diarrheal disorders were reported.

Seventy cases of remittent fever were treated in quarters and were of the following duration: One day, 5; two days, 11; three days, 13; four days, 8; five days, 4; six days, 2; seven days, 4; eight days, 1; nine days, 2; ten days, 5; twelve days, 2; thirteen days, 1; fifteen days, 1; seventeen days, 1; eighteen days, 1; twenty days, 2; twenty-seven days, 1, and 6 furloughed after thirteen to thirty-six days of treatment.

Ten cases of this disease were transferred to hospital, of which 5 were changed to typhoid fever; 2 were returned to the regiment after twelve and twenty days, respectively, diagnosis unchanged; 1 had the diagnosis changed to chronic diarrhea, and 2 could not be traced.

In addition to the 5 cases of remittent fever changed to the diagnosis of typhoid fever, there were found in the Third and First Division hospitals 10 other cases of typhoid fever affecting men of the Third Nebraska whose admissions to sick report had not been accounted for during October. With these additions the cases of this disease amount to 40.

We believe that a closer estimate of this disease for October would be arrived at by adding the cases of supposed malarial infections lasting from ten to thirty-five days, increasing thereby the total number of cases of typhoid fever in October to about 60.

It is important to here note that the Third Nebraska abandoned its camp at Pablo Beach, Fla., on October 5, going to Fairfield, Fla., where it remained till October 23, on which date the command left for Savannah, Ga., arriving in that city on October 24.

Notwithstanding the good effect observed upon the general health of the regiment and the marked reduction in the prevalence of typhoid fever occasioned by the abandonment of its much infected camp site on Sep-

tember 10 and 11, we find that cases of this disease have continued to occur during October, and this, too, although the regiment again moved its camp site on October 5.

We will have occasion to point out, from time to time, other organizations in which one or more moves did not suffice to stamp out typhoid fever.

In a mean strength of 1,005 officers and men for November there were 90 admissions to sick report, divided as follows: Diarrhea, 3; chronic diarrhea, 1; acute dysentery, 1; intermittent fever, 1; remittent fever, 10; typhoid fever, 23; all other causes, 51.

The diarrheas were of short duration. The case of dysentery was returned to duty after thirteen days. The case diagnosed as intermittent fever lasted twenty-one days. Four of the cases of remittent fever were treated in quarters and were of the following duration: One day, 1; three days, 1; four days, 1; and 1 still under treatment at the end of twelve days. Six cases were sent to division hospital with the following result: One returned to the regiment after seven days, 1 after nine days, 1 after twenty-two days, 2 after twenty-six days, diagnosis unchanged, and 3 changed to the diagnosis of typhoid fever. This would increase the number of cases of the latter disease for November to 26, not including the 4 cases of supposed malaria lasting from twenty-one to twenty-six days.

We observe that notwithstanding the frequent changes of camp site typhoid fever has not ceased in this regiment. The occurrence of only 4 cases during the latter half of November points, however, to the gradual extinguishment of this disease.

In December we find in an average strength of 993 officers and men 141 admissions to the sick report. Intestinal disorders constitute only 6 cases, 1 of which is changed in hospital to the diagnosis of typhoid fever. Five cases of malarial remittent are admitted, 4 of these being of short duration, and 1 changed in hospital to the diagnosis of typhoid fever. Seven cases of typhoid fever are reported by the surgeon and 4 cases are admitted to the general hospital at Fort McPherson, these not having been accounted for by the surgeon. We thus find 14 cases of typhoid fever for the month of December, 5 companies being entirely free of the disease and 3 others having only 1 case.

Briefly recapitulating the history of typhoid fever in this regiment, we find that the Third Nebraska Volunteer Infantry, having been mustered into service at Fort Omaha, Nebr., on July 13, arrived at Jacksonville, Fla., on the 22d of that month with good general health, but with 2 cases of typhoid fever—one a soldier of Company D, admitted July 26 as a case of acute diarrhea, and the other a member of Company H, admitted to sick report July 31 as acute cardialgia. This regiment therefore imported typhoid fever into its Florida camp. Its location, however, near the Second Mississippi Infantry, already infected, insured the further develop-

ment of the disease. Hence seventeen days after its arrival at Jacksonville, or on August 8, we find cases of typhoid fever occurring, although the presence of the disease was not fully recognized till toward the end of August. The disease progressed slowly, only 8 cases occurring in the entire regiment between the 8th and 21st of August. During the last ten days of the month, or two weeks after the earliest cases began, 45 men were transferred to hospital with this disease, all companies being infected. The conditions now being favorable for the further propagation of this disease, we find 60 cases occurring during the period September 1 to 10; 70 for the same interval, September 11 to 20, and 16 for the last ten days of the month. This reduction of the disease can be attributed to the removal of the regiment on September 10 to the seashore, some 15 miles distant. Notwithstanding this move and a second change of camp on October 5, typhoid fever continued to affect the regiment, though in a greatly lessened degree. Forty acknowledged cases of the disease occurred during the month of October. The number of cases during the period October 1 to 10 was 17, as against 16 cases for the last ten days of September. The number fell still lower for the period October 11 to 20, there being only 12 cases, and 11 cases for the last eleven days of the month.

The regiment having again moved on October 23, we find 11 cases for the first ten days in November, 12 cases for the period November 11 to 20, and 3 cases only for the last ten days of the month. During December 14 cases occurred. The regiment embarked for Cuba on December 30 and 31, 1898.

ONE HUNDRED AND SIXTY-FIRST INDIANA VOLUNTEER INFANTRY.

ABSTRACT OF SURGEON'S STATEMENT.

[Maj. W. Smith, surgeon, U. S. Volunteers.]

This regiment was mustered into service on July 15, 1898, at Camp Mount, Indianapolis, where it remained till August 11. During the first half of this time the regiment was quartered in the barns of the State fair grounds. Then tents were obtained and the regiment camped for two weeks in an open meadow. The water supply was that of the city of Indianapolis. Fecal material was deposited in pits, into which dry earth was thrown twice daily. Diarrhea prevailed in the State encampment. Four cases of typhoid fever occurred within two weeks after the regiment was in camp and a fifth case a few days later. The patients were at once sent to one of the city hospitals and all sinks promptly disinfected with lime and a solution of carbolic acid. No other cases of typhoid fever occurred during this encampment. The regiment left Camp Mount, Ind., August 11, arrived at Jacksonville, Fla., August 14, and was assigned to the Third Division, Seventh Army Corps. It was established in camp at Panama Park,

Fla., near the camp of the Third Nebraska Volunteer Infantry. Like the other regiments of this division, its water supply was piped from deep artesian wells. Pits for the reception of fecal matter were dug to a depth of 6 feet, in a sandy soil, and were located about 30 to 40 yards from the mess tents. Each man was required to cover his stool, but this has not been perfectly carried out. Since arrival at Panama Park diarrhea has been the prevailing disease, attributed to change of climate and water and to excessive heat. There have been a large number of mild malarial fevers since arrival. These are not plainly intermittent or remittent. The cases promptly yield to quinine with phenacetine within three or four days. They have only exceptionally been severe enough to put a soldier on sick report. Only two or three of these cases have been sent to division hospital. The regiment is supplied with wall tents, five men to a tent. The tents have been floored. There is no regimental canteen, but there are licensed "shacks" near, at which the men may purchase drinks made from carbonated water and mixed in the presence of the purchaser. There are shallow wells in private yards near by, but the men are forbidden the use of this water.

REMARKS BY THE BOARD.

Examination of the regiment sick and wounded report for July shows that there were 38 admissions for diarrhea in an average strength of 1,406. These cases were of short duration. Of intermittent fever there were 3, 1 quotidian, 1 tertian, and 1 quartan intermittent. In the latter case the diagnosis was changed during August to remittent malarial fever, the case remaining on sick report twenty-nine days. In the other 2 cases the duration was seven and thirteen days, respectively. Remittent fever contributed 9 cases during July. Of these, 5 were of less than three days' duration; 2 lasted four days; 1 five days, and 1 eight days.

Typhoid fever contributed 3 cases. The first case was admitted to sick report July 16 (Company I), the day following the muster in of the regiment, although companies had been arriving since July 1. The second case of this disease occurred on July 18 (Company I), and was followed by a case admitted on July 25 (Company A), and by a fourth case on August 1 (Company C). These cases were transferred for treatment to one of the city hospitals of Indianapolis.

During the month of August, in an average strength of 1,282 officers and men, there were 93 admissions to sick report, divided as follows: Acute diarrhea, 32; intermittent fever, 13; remittent fever, 23; undetermined fever, 3; typhoid fever, 2; all other causes, 20.

The diarrheas were mild and of short duration, except in 1 case, which lasted fifteen days. Intestinal disorders appear to have almost ceased during the latter half of August, after arrival in Florida, only 1 case having been admitted during this time.

The cases of intermittent fever, with 1 exception, occurred prior to the arrival of the regiment at Jacksonville, Fla. All were of short duration.

The cases of remittent fever were, with few exceptions, of short duration. Sixteen lasted less than five days; 1 was of six days' duration; 1, eight days; 2, nine days; 1, eleven days; 1, thirteen days, and 1 was transferred to hospital after seventeen days' treatment. In the latter case, which began on August 14, the day of arrival at Panama Park, Fla., the diagnosis was changed to typhoid fever.

Of the 3 undetermined fevers 1 was diagnosed later as remittent fever, remaining under treatment for twenty-three days; 1 was changed to intermittent fever lasting sixteen days, and 1 changed to the diagnosis of syphilis.

Turning to the occurrence of fevers during July and August, we see that during the former month 1 case of intermittent fever, quartan, was of prolonged duration, viz, twenty-nine days, the diagnosis being afterwards changed to remittent fever. In August we find 13 admissions for intermittent fever, 6 of which were of the quartan type, an apparently impossible percentage of the latter variety. All of these were of short duration (one to five days) and 1 eight days' duration. In August the cases of this disease reach 23 in number; 8 are of less than forty-eight hours' duration, and can not safely be accepted as cases of remittent fever; 9 vary from three to six days in length, leaving 6 whose duration is from eight to thirteen days. In 1 case the diagnosis is changed to typhoid fever.

With regard to the occurrence of typhoid fever, we find that while the regiment was still in camp at Indianapolis 3 cases of this disease were admitted to sick report during the latter half of July and 2 other cases prior to the 11th of August, the day of departure for Jacksonville. We also note that a case of supposed quartan intermittent, admitted on July 30, was afterwards changed to remittent fever, and was of protracted duration. If this case should be added to the typhoid list, then we should have a total of 6 cases occurring while the regiment was still at Camp Mount. These cases were distributed as follows: Company I, 3 cases (1 remittent); Company A, 1 case; Company C, 1 case, and Company G, 1 case. We also observe that a case of remittent fever, admitted on August 14, the day of arrival at Jacksonville, and transferred to the Third Division Hospital August 17, was there diagnosed as typhoid fever. Thus, we may say that this regiment not only had typhoid fever in its State encampment, but that it imported at least 1 case into its new camp at Panama Park, Fla.

Concerning the health of the regiment for September, the surgeon states that the prevailing diseases were acute diarrhea, malarial and typhoid fevers.

An examination of the sick and wounded report for this month shows that in an average strength of 1,276

officers and men there were 106 admissions, divided as follows: Acute diarrhea, 38; remittent fever, 31; not diagnosed, 35; typhoid fever, 2. These figures are taken from the regimental report.

Of the 38 cases of diarrhea all were treated in quarters. Thirty lasted from one to three days, 7 from four to seven days, and only 1 was of thirteen days' duration. We note, however, that 4 cases of diarrhea, returned to duty after two to four days' treatment, were within two days thereafter transferred to Convalescent Hospital, Pablo Beach, and furloughed twelve to twenty-five days later.

The cases diagnosed as remittent fever were all treated in quarters and returned to duty as follows: After two days, 4; three days, 1; four days, 1; five days, 4; six days, 5; seven days, 8; eight days, 3; twelve days, 1; fifteen days, 1; sixteen days, 1; eighteen days, 1; nineteen days, 1. We observe that 3 cases of remittent fever which were returned to duty after five, six, and eight days, respectively, were, on the following day, transferred to the Convalescent Hospital at Pablo Beach, Fla., and furloughed eleven days later. We further observe that on September 13 there were transferred to Pablo Beach 26 additional cases of remittent fever, concerning the date of whose admissions to sick report nothing is noted on the surgeon's monthly report of sick. These patients were furloughed, with diagnosis unchanged, after periods varying from eleven to thirty-five days' treatment.

Of the 35 cases not diagnosed on the September report 15 were treated by the regimental surgeon, of which 1 was changed during October to acute diarrhea and 14 to remittent fever. The case of diarrhea lasted eight days; the cases of remittent fever were of the following duration: Three days, 2; six days, 2; eight days, 1; ten days, 1; twelve days, 1; fifteen days, 1; sixteen days, 1; nineteen days, 2; twenty-one days, 1; twenty-four days, 1. Twenty cases were transferred to the division hospital, of which 18 were diagnosed as typhoid fever and 2 as remittent fever. We observe that these 2 cases were furloughed after forty-four and fifty-three days in hospital, respectively. So that in arriving at the number of typhoid fever cases in this regiment for September, we must add to the 2 cases of typhoid fever (both fatal) diagnosed by the regimental surgeon, 18 other cases so diagnosed at the division hospital. We also find in the October report 1 case of typhoid fever (hospital steward) which began on September 10. This gives a total of 21 cases of this disease, so diagnosed, for September.

We do not believe, however, that this number expresses the full prevalence of typhoid fever for September in this regiment, since it does not include the large number of fevers of fourteen days' or longer duration which were attributed to malarial infection. We find not less than 42 cases of supposed malarial fever lasting from fifteen to fifty-three days, the ma-

jority of which, we believe, should be placed among the typhoid infections for reasons hereafter to be stated. It has not been possible to chart 35 cases among the malarias for this month, since the dates of their admission on sick report could not be obtained. Therefore the line indicating long malarias for September is to that extent deficient.

The regiment occupying its same camp site till October 23 we find for this month, in an average strength of 1,253 officers and men, 125 admissions from all causes, divided as follows: Dysentery, 1; intermittent fever, 2; remittent fever, 17; undetermined fever, 31; typhoid fever, 58; not diagnosed, 8; all other causes, 8.

The 2 cases of intermittent fever were treated in quarters and returned to duty after four to seven days.

Of the cases diagnosed as remittent fever 14 were treated in quarters and 3 sent to the division hospital. The duration of those treated in quarters was as follows: Six days, 2; seven days, 1; eight days, 2; nine days, 2; eleven days, 3; twelve days, 1; thirteen days, 1; sixteen days, 1; eighteen days, 1. The 3 cases sent to the division hospital were changed to typhoid fever.

Of the 31 undetermined fevers, 21 were sent to the Third Division Hospital and all changed to typhoid fever. Of the 10 cases of undetermined fever which were transferred to the Second Division Hospital 3 were returned to the regiment after nine and fifteen days, respectively, diagnosis remittent, and 7 were changed to typhoid fever. Of the 8 cases not diagnosed 1 was later changed to orchitis, 2 to measles, 1 to rheumatism, 1 to dysentery, and 3 to typhoid fever.

Thus we must add to the 58 cases of typhoid fever reported by the regimental surgeon 3 cases of supposed remittent fever, 28 cases of undetermined fever, and 3 cases in which no diagnosis had been made, bringing the total for October to 92 cases. (Vide chart.)

October 23 the regiment left its old camp, which it had occupied since August 14 and in which 102 cases of typhoid fever had occurred, and arrived at Savannah, Ga., on October 24. Its strength for November was 1,241, with 319 admissions to sick report, as follows: Intestinal diseases, 21; intermittent fever, 3; remittent fever, 93; continued malarial fever, 19; undetermined fever, 2; malarial cachexia, 4; typhoid fever, 16; other causes, 161.

The intestinal diseases were all returned to duty within six days.

Two cases of intermittent fever were treated in quarters, lasting four to twenty-two days. One case was sent to hospital and remained under treatment thirty-seven days, diagnosis unchanged. Ninety cases of remittent fever were treated in quarters and returned to duty as follows: One to three days, 17; four to six days, 30; seven to ten days, 19; eleven to fifteen days, 13; sixteen to twenty days, 5; twenty-four days, 1; and in 5 cases no termination was given. Three cases were sent to division hospital and furloughed after

nineteen to thirty days. Of the cases diagnosed by the surgeon as continued malarial fever, 18 were treated in quarters and were of the following duration: Nine to eleven days, 2; twenty days, 3; twenty-five days, 3; twenty-eight to thirty days, 4; thirty-one to thirty-five days, 4; no terminations given, 2. One case was transferred to hospital and changed to typhoid fever.

Of the 16 cases reported as typhoid fever by the surgeon the diagnosis was confirmed in 8 cases, and in 8 cases changed to other diseases, viz, intermittent fever, 3; bronchitis, 1; synochra, 1; acute gastritis, 2; catarrhal pneumonia, 1.

Two cases of typhoid fever, not reported by the surgeon, were found in the division hospital, thus making 13 cases for the month of November.

Although we have charted these 13 cases of recognized typhoid fever for November, we feel confident that there should be added not less than 14 cases of supposed continued malarial fever and at least 6 cases of supposed remittent malarial fever, thus increasing the cases to 33 for November.

The regiment, numbering 45 officers and 1,280 enlisted men, embarked at Savannah, Ga., for foreign service, on December 12, 1898. For this month 2 cases of typhoid fever are reported, viz, December 11 and 16, and but few so-called malarial fevers. (Vide chart vol. 2.)

SIXTH MISSOURI VOLUNTEER INFANTRY.

ABSTRACT OF SURGEON'S STATEMENT.

[Maj. Keating Bandy, surgeon, U. S. Volunteers.]

The regiment was mustered in at Camp Bebe, near Jefferson Barracks, Mo., on July 23, 1898. It remained in camp at this point until August 11, 1898. The water was obtained at first from numerous springs in the vicinity, to the use of which the occurrence of barbaea, dysentery, and malarial diseases was attributed. For this reason the use of this water was discontinued and the water supply of the city of St. Louis substituted. Pits were dug and used as sinks, the contents being covered with earth. One case of typhoid fever occurred within a few days after the regiment had assembled. This case was promptly sent to a hospital in the city of St. Louis.

The regiment left Jefferson Barracks August 12, coming direct to Jacksonville, Fla., where it arrived on August 15. It was assigned to the Third Division, Seventh Army Corps, and placed in camp at Panama Park, near the camp of the Fourth Illinois Infantry. This camp site was elevated, well drained, and suitable in all respects. Water was obtained from artesian wells and was abundant. Sinks could easily be dug to the depth of 6 or 8 feet. These were placed about 40 or 50 yards from the mess tents. Each man was required by order to cover his stool, and this order has been rarely disobeyed. In addition, it has been the duty of the fatigue party to sprinkle lime freely into the sinks

twice daily. The regiment is provided with wall tents, six men to a tent. The tents have not been floored. Diarrhea has been the prevalent disease since arriving at Panama Park. According to Major Bauduy's testimony, no typhoid fever has yet occurred, and but few malarial fevers. There have been very few cases sent to the division hospital.

REMARKS BY THE BOARD.

Examination of the regimental sick and wounded report for the period July 20 to 31, 1898, shows that the health of the men was good for this period, there having been only 34 admissions from all causes in an average strength of 1,296 officers and men. The causes of admission were malarial fever, 12; acute diarrhea, 6; typhoid fever, none; all other causes, 16.

No distinction as to types were made in the malarial fevers, all of which were of short duration. The diarrheal diseases were of trivial character.

The regiment arrived at Jacksonville, Fla., on August 15 and went into camp with the other regiments of the Third Division at Panama Park, Fla.

During the month of August, in an average strength of 1,295 officers and men, there were 127 admissions to sick report, divided as follows: Acute diarrhea, 52; intermittent fever, quotidian, 31; intermittent fever, tertian, 2; remittent fever, 29; typhoid fever, none; all other causes, 13.

All of the cases of diarrhea occurred after the regiment reached its Florida camp. Fifty cases of diarrhea were treated by the regimental surgeon and were of the following duration: One day, 5; two days, 10; three days, 11; four days, 13; five days, 4; six days, 3; eight days, 1; nine days, 2; nineteen days, 1. Two cases were sent to hospital after twenty-one and twenty-two days, respectively, and in both the diagnosis was changed to typhoid fever.

Of the 31 cases of intermittent fever, 4 occurred at Camp Bell, Mo., and 27 after the regiment arrived at Jacksonville. Twenty-two were treated in quarters, and were of the following duration: Two days, 9; three days, 6; four days, 3; five days, 1; ten days, 2; eighteen days, 1. Nine cases were transferred to hospital, of which 6 were returned to the regiment after five, seven, thirteen, fourteen, seventeen, and thirty-four days, respectively, with diagnosis unchanged. Two were changed to the diagnosis of typhoid fever and 1 could not be traced.

Of the 29 cases of remittent fever, 4 were admitted at Camp Bell, Mo., and 25 occurred after the regiment reached Florida. Twenty-one cases were treated in quarters, and were of the following duration: One day, 6; two days, 3; three days, 6; four days, 1; five days, 1; six days, 2; eight days, 1; thirteen days, 1.

Eight cases of remittent fever were transferred to the division hospital, with the following result: Returned to the regiment after six days, 1; eight days, 1; twelve days, 1; thirty-two days, 1; furloughed after forty-one days, 1; changed to the diagnosis of typhoid fever, 1; and 2 could not be traced.

Investigating the dates of admission to sick report of the 5 cases of typhoid fever above referred to, we find that of the 2 cases diagnosed as intermittent fever, quotidian, 1 (Company G) was admitted on August 1 and transferred to hospital on August 16, the day following the arrival of the regiment at Jacksonville; the other (Company M) on August 28, and transferred to hospital on the same date. The 2 cases changed from acute diarrhea to typhoid fever were admitted on August 26 and 27, both from Company G, and were not transferred to division hospital till September 17 and 18, the proper diagnosis not being made until the latter dates. The case changed from remittent fever to typhoid fever was admitted from Company B on August 14 as remittent fever and sent to division hospital on August 16, and later changed to the diagnosis of typhoid fever. A sixth case was admitted to the division hospital on August 15.

We thus see that typhoid fever had made its appearance in the Sixth Missouri Infantry already during its State encampment, and that this regiment imported at least 3 cases of this disease into its new camp at Panama Park, Fla. We here note that in addition to the 6 cases of typhoid fever so diagnosed, there occurred during the latter part of August 5 cases of supposed malarial fevers, lasting from ten to forty-two days. We are inclined to regard these as typhoidal rather than as malarial infections.

On the September report of sick and wounded the surgeon remarks: "The prevailing diseases in our camp are fevers. Most of said fevers are, in my opinion, of a low grade, or pernicious malarial type."

For this month, in a strength of 1,201 officers and men, there were 288 admissions to sick report, divided as follows: Acute diarrhea, 11; acute dysentery, 1; intermittent fever, quotidian, 9; remittent fever, 36; undetermined fever, 184; continued fever, 1; typhoid fever, 16; other diseases, 30.

The cases of diarrhea were treated in quarters, and were of the following duration: Two days, 1; three days, 1; four days, 4; eight days, 2; ten days, 2; twelve days, 1. The case of acute dysentery was sent to division hospital, and returned to regiment at the end of twelve days.

Of the 9 cases of intermittent fever, quotidian, 1 was treated in quarters and was returned to duty at the end of six days. Eight cases were sent to the division hospital, with the following result: Three returned to regiment after six, nine, and thirty-four days, respectively, diagnosis unchanged; 1 furloughed after eight days; 3 changed to the diagnosis of typhoid fever, and 1 could not be traced.

Of the 36 cases of remittent fever, 24 were treated in quarters, and were of the following duration: Three days, 3; four days, 4; five days, 4; six days, 5; seven days, 1; eight days, 2; nine days, 4; 11 days, 1. Twelve cases were sent to division hospital, and returned to regiment as follows: After five days, 1; nine days, 1; ten days, 2; twelve days, 2, and 4 changed to typhoid fever.

All the cases of "undetermined fever" were sent to the Third Division hospital, with the following result: Three cases changed to intermittent fever, 27 cases changed to remittent fever, 139 cases changed to typhoid fever, and 15 cases could not be traced. Of the 3 cases diagnosed as intermittent fever, the duration of the disease was twenty-five to thirty-seven days in 2 cases, and 1 was furloughed after twenty-one days. Of the 27 cases changed to remittent fever, 4 were returned to the regiment after eight, twelve, seventeen, and twenty-three days; 6 furloughed after ten, eleven, nineteen, twenty-six, twenty-eight, and thirty-three days; 17 transferred to general hospitals after an average of fourteen days' treatment in division hospital, the diagnosis being changed to typhoid fever in 6 of these cases.

The case diagnosed by the regimental surgeon as "continued fever" was changed to typhoid fever in the division hospital; so that as regards the occurrence of typhoid fever in this regiment for the month of September we must add to the 16 cases diagnosed as such by the surgeon the following:

	Cases.
Intermittent fever changed to typhoid	3
Remittent fever changed to typhoid	10
Continued fever changed to typhoid	1
Undetermined fever changed to typhoid	139
Partial paralysis changed to typhoid	1
Stricture changed to typhoid	1
Hernia changed to typhoid	1
Total	156

thus making a total of 172 cases.

The following table shows these cases by company and date of occurrence:

September.	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
2.							1							1
3.							1		1					2
4.														2
7.						1								1
8.			1				1		1					2
10.	1													2
11.							1		1					3
12.		1		1	1		1				3			7
14.		2												1
15.		4				1					1			5
16.				1					2		1			4
17.	1						2					1		4
18.		1					6			1				8
19.			1						1			1		3
20.					1	1				1				3
21.	1	3		1	3				1		1			10
22.		1	1	1					3		1			11
23.				1	1	1			1			1	2	8
24.	1	2			2	1				2	2			10
25.			1				1	1	1					4
26.		1	2	1			1			1				6
27.		1			3							4	1	9
28.	1	5	1	1		5	1	2	3	2	1	2	2	26
29.												1		1
30.	2	3	8		7	4		1		3	1			29
Total	1	1	1	1	1	1	1	1	1	1				6
Total	9	25	15	8	17	16	18	6	7	16	17	12	6	172

It will thus be observed that the Sixth Missouri Volunteer Infantry, arriving at Panama Park, Fla., on August 15 with 3 cases of typhoid fever, had developed 3 additional cases during the last six days of that month, these cases not being transferred to the division hospital till about three weeks later. With the advent of September cases of the disease became more frequent,

so that for the period, September 1 to 15, there occurred 34 cases. The occurrence of such a large number of cases within the first month of regiment's occupancy of a new camp is quite exceptional, and must be attributed to the arrival of this regiment at Panama Park, Fla., at a time when the camp was already thoroughly infected with typhoid fever.

Concerning the health of the regiment for October, the surgeon remarks:

The prevailing diseases were typhoid fever, malaria, and catarrhal jaundice. During the latter part of October very few cases were sent to the division hospital. No new cases of typhoid fever have developed lately; also little or no malaria.

For this month with an average strength of 949 officers and men there were 104 admissions to sick report, divided as follows: Intermittent fever, 2; remittent fever, 7; undetermined fever, 30; typhoid fever, 53; all other causes, 12.

The 2 cases diagnosed as intermittent fever were transferred to hospital and furloughed at the end of thirteen and eighteen days' treatment, diagnosis unchanged.

Of the 7 remittents, 6 were treated in quarters and returned to duty—at the end of seven days, 1; eight days, 2; eleven days, 2; and seventeen days, 1. One case was sent to the second division hospital and could not be traced.

The cases of undetermined fevers were all sent to hospital with the following result: Sixteen cases changed to typhoid; 4 diagnosed as remittent fever, of which 3 went to duty at the end of four, seven, and twelve days, and 1 transferred to Fort Myer and changed there to the diagnosis of typhoid fever. Ten cases could not be traced.

So that to the 53 cases diagnosed as typhoid fever by the regimental surgeon there must be added 17 cases of undetermined fever changed to typhoid, and 21 additional cases of typhoid fever found at the Third Division Hospital, but which had not been entered by the regimental surgeon on his monthly return of sick. We thus find 91 cases of undoubted typhoid fever in this regiment for October, distributed by companies and dates of occurrence as shown by the following table:

October.	Company.												Staff.	Total.
	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.		
1.		3		1			2							6
3.		1					2	1			1	2		9
4.		1						3	2	1			1	9
5.				2	1	1					3			9
6.						2			3		1	1		8
7.		1				1			1		2		1	6
8.			1		1									2
9.									2					3
10.		1		2					2		3	1	1	11
12.														1
13.												1		1
14.									1		1			2
15.		1									1			3
18.		1		2						1				5
19.						1								1
20.									1			1		2
21.			1					2	1					4
22.					1							1		2
29.		1								1	1			1
30.					1		1	1					1	6
Total	11	4	7	5	5	3	9	14	3	9	8	8	5	91

Two battalions of the regiment left the camp at Panama Park, Fla., on November 6, going thence to Savannah, Ga. The Third Battalion followed on November 23. In an average strength of 729 there were for November only 18 admissions, as follows: Remittent fever, 3; undetermined fever, 4; typhoid fever, 8; other causes, 3.

Of the remittent fevers 1 was returned to duty after thirteen days; 1 after fifteen days, and 1 after nineteen days.

The undetermined fevers were sent to hospital, where the diagnosis was changed to remittent fever in 3 cases, these lasting four, six, and fifteen days. One was changed to typhoid fever. Four other cases of typhoid fever were reported from division and other hospitals, thus making 13 cases of this disease for November.

On the December report the surgeon states that the health of the regiment has been excellent. In an average strength of 1,213 there were only 40 admissions. No diarrheal or malarial diseases are reported and only 2 cases of typhoid fever, both of which were admitted December 1. Two other cases of this disease were admitted to the general hospital at McPherson on December 13. The commencement of the attack has, however, not been ascertained in these cases. The regiment embarked for Habana, Cuba, on December 21, 1898.

SECOND SOUTH CAROLINA VOLUNTEER INFANTRY.

[Maj. E. J. Wannamaker, surgeon, U. S. Volunteers.]

This command was first mustered in at Columbia, S. C., on May 21, 1898, as an independent battalion of volunteer infantry, and the full regimental quota was not obtained until the latter part of July. During this time it occupied its same camp site at Columbia. This regiment joined the Seventh Army Corps at Jacksonville, Fla., on September 16, 1898, subsequent to the inspection of that camp by this board. We do not, therefore, propose to trace minutely the duration of the various intestinal and malarial disorders; but will be satisfied with a brief statement as to the occurrence of typhoid fever in this regiment.

We find that the first case of typhoid fever was reported on June 20, in Company D, and that no other case appears to have occurred until July 25, in Company C.

During the month of August, in a mean strength of—officers, 46, and enlisted men, 968, 6 cases of typhoid fever have been traced. For the same month there were recorded 122 intestinal disorders and 59 malarial fevers. Whether any of the cases in the two latter classes subsequently proved to be typhoid fever we have been unable to ascertain. No case of this disease is reported after August 20 until September 4, when 1 case occurred.

The regiment arrived at Jacksonville, Fla., Septem-

ber 16, and was assigned to the Second Brigade. Third Division, Seventh Army Corps, and placed in camp at Panama Park.

It imported into this camp not less than 8 cases of typhoid fever, which occurred between the 18th and 26th days of September. Four additional cases are recorded on the 30th of September.

Typhoid fever continued to prevail to some extent in this regiment during the first three weeks of October, when 54 cases are recorded and confirmed.

The regiment left Panama Park on October 21, arriving at Savannah, Ga., the following day. No other cases are recorded for the last ten days of October.

During the month of November we have been able to trace 7 cases of typhoid fever, and during December, 3; making a total of 85 cases of typhoid fever for the period June 1 to December 31, 1898, with 9 deaths so far as we have been able to trace the cases.

GENERAL PROGRESS OF TYPHOID FEVER IN THE THIRD DIVISION.

We have so fully reviewed, in connection with each regiment's history, the course of typhoid fever that little remains to be said concerning the progress of the disease. We observe that in this division 7 of the 8 regiments imported cases of typhoid fever into their camp at Panama Park. The first regiment to arrive at this camp was the Second Mississippi Volunteer Infantry (June 21), which imported 9 cases from its camp at Jackson, Miss. The Second U. S. Volunteer Cavalry, arriving June 28, did not import typhoid fever; with this exception, however, the remaining regiments which came in July, August, and September all brought cases of the disease. It is not necessary, therefore, to look to other sources for the origin of typhoid fever in this division. Indeed, the opportunity for infection outside of the camp was very slight. Once imported, the course of the disease in the individual regiments did not differ from its progress in other divisions of this corps, or in the First, Second, Third, or Fourth Corps, heretofore treated of. With few cases during the first month after its introduction its progress was, as a rule, steady during the second and third months, being marked by company epidemics of greater or less severity. We note that in the case of the First South Carolina Infantry, which joined this division on July 30, 1898, typhoid fever made but slight progress, although the conditions for the propagation of the disease appeared not to differ from those by which all other regiments of this division were surrounded. We have been unable to offer any explanation for this partial freedom from typhoid fever in this regiment.

There was nothing in the course of the disease in any of the regiments that indicated any contamination of the regimental or company water supply.

Table showing for the regiments of the Third Division of the Seventh Army Corps assembled at Jacksonville, Fla., the mortality and morbidity from typhoid fever.

Regiments.	Mean strength.	Certain and probable cases of typhoid fever.	Deaths from typhoid fever.	Deaths from all diseases.	Deaths from typhoid fever in 100 cases.	Percentage of deaths from typhoid to deaths from all diseases.	Morbidity of typhoid fever in 1,000 mean strength.	Deaths from typhoid fever in 1,000 mean strength.
<i>Third Division, Seventh Army Corps.</i>								
Fourth Illinois	1,194	238	20	25	8.40	80.00	199.32	16.75
One hundred and sixty-first Indiana	1,304	134	14	15	10.44	93.33	102.76	10.73
Second Mississippi	1,217	118	17	22	14.40	77.27	96.95	13.96
Sixth Missouri	1,149	286	19	22	6.64	86.36	248.91	16.53
Third Nebraska	1,262	280	27	30	9.64	90.00	221.87	21.39
Second South Carolina	945	85	8	14	9.41	57.14	89.94	8.46
Second U. S. Volunteer Cavalry	919	151	15	18	9.93	83.33	164.30	16.32
Total	7,990	1,292	120	146	9.28	82.19	161.70	15.01

MALARIAL DISEASES IN THE SEVENTH ARMY CORPS.

At the request of this board, Dr. James Carroll, acting assistant surgeon, U. S. Army, was sent to Camp Cuba Libre for the purpose of determining by blood examinations whether malarial diseases were as prevalent as the diagnoses of regimental and division hospital medical officers would indicate. The following report is submitted entire:

WASHINGTON, D. C., September 19, 1898.

Maj. WALTER REED,

Surgeon, U. S. Army.

SIR: I have the honor to submit the following report of work done at Camp Cuba Libre, Jacksonville, Fla., under par. 32, S. O. No. 206, A. G. O., September 4, 1898, and instructions received personally from you.

I reported at the Second Division Hospital on the afternoon of September 5, and on the next morning drew blood from 16 patients for the purpose of applying the Widal test as the first step in determining the nature of the fevers prevailing there. Brief notes were taken of the dates of admission, history, and prominent features in each case. Of the 16 specimens taken, 14 gave a positive reaction next day, 1 was negative, but suspicious from the fact that motility was impaired and a small number of the bacilli showed a tendency to agglutinate, and 1 was entirely negative. The case from which the latter was taken had only been admitted to hospital on the preceding day, with an evening temperature of 104° and a previous history of epistaxis.

September 8 I drew blood from 45 patients in another ward, making no selections and taking them in regular order. Three of these were thought by the physician in charge of them to be probable cases of malarial fever. One was supposed to have had a frank chill, with a regular ague shake every other day since his admission, September 1. He had been sick in quarters seven days previously, and his tongue presented the appearance of that of a typhoid-fever patient. Another, admitted to hospital August 17, had been sick in quarters two weeks. The third had been sick nearly two months, three weeks of that time in quarters, doing light duty. He was taken ill on the second or third day after he arrived in camp, with malaise and fever, with sweating, but had never had a chill. Examinations of the fresh blood for malarial parasites in these cases were negative, but all three reacted positively

to the Widal test. Of the 45 samples of blood taken, 39 gave a positive reaction, 3 gave a reaction that was incomplete, and 3 negative. Those noted at the time as incomplete gave what appeared to be a positive reaction next morning. Of the 3 negative specimens, 1 showed a positive reaction with distinct clumping next morning, the other 2 remained unchanged. One of these negative cases gave a positive reaction with a second specimen drawn September 16, the other still remaining negative, so that out of 45 consecutive cases only 1 remained absolutely negative.

My attention was next directed to the receiving ward of this hospital from whence the patients were distributed, in the hope of securing malarial cases immediately upon admission, but only a few promising ones could be found. One man of the reserve ambulance company was doing duty with an evening temperature of 103° and morning temperature of 100°. He had a large, pale, furred tongue, and gave a history of malaise for about two weeks. Examinations for malarial parasites, negative. Widal test, negative. Another case examined September 12 was admitted to hospital September 11, with an evening temperature of 104° and morning temperature of 102°. Quinine had been withheld and an examination was requested for malarial infection. History: Sick in quarters six days, feeling badly nine days before going on sick report. His tongue is slightly coated and quite red at the tip and edges. Examination for malaria, negative. Widal test, negative. Still another, a first lieutenant, who continued to perform his duties, complains of headache and soreness of the bowels for several days, with anorexia. He had no chill, his tongue is moist and furred, edges slightly reddened. Quinine has been withheld and an examination of his blood for malarial parasites requested. Result negative. Widal test, negative. When I left the camp, four days later, I was told that his condition was about the same and appendicitis was suspected. I believe he was in the prodromal stage of typhoid fever.

I was next called to a supposed case of tertian intermittent fever from which quinine was said to have been withheld. He gave a history of having been sick ten days or two weeks before his admission to sick report two days ago. He had had chilly sensations followed by fever and sweating, at irregular intervals. Took quinine when he was first feeling badly and is now taking 5 grains every four hours. Examinations for malaria, negative. Widal test, positive.

I was shown a case of considerable interest on September 11. Private A. G., Company K, Forty-ninth Iowa, admitted to hospital September 7, had been sick in quarters for one week. History of headache, pains in the back, and epistaxis occurring several times. Pulse very slow, about 50 to 60. There is much depression, a slight mental hebetude, and he has vomited blood several times. There are no signs of jaundice. Examinations of fresh blood for malarial parasites, negative. Widal test gives prompt arrest of motility and slight agglutination at the end of an hour. I ought to have stated that his temperature was subnormal, and there was a constant hiccup. Patient died at 9 a. m., September 13, and at the autopsy, which I witnessed, there were found thickened, injected and ulcerated Peyer's patches in the ileum and appendix; swollen glands in the mesentery and meso-appendix; moderate splenic tumor; liver but little changed from normal. The mucous membrane of the stomach was intensely injected and the organ contained a thin, dark, bloody fluid; the intestine also contained a tarry material. Very marked changes were apparent in the kidneys which appeared to be the seat of an acute parenchymatous nephritis. Both were enormously swollen, soft, and their surfaces were dotted with enlarged stellate veins. The cortex of each was very much increased in thickness, grayish, cloudy, and marked with dark-red pin-head spots (Malpighian bodies) over the cut surface. The pyramids were darkly congested. His urine was said to have shown about one-third of its volume of albumen.

The receiving ward proving very unfruitful in producing cases

of malaria, I deemed it best to apply the Widal test in conjunction with an examination of the fresh blood for malarial parasites, where there seemed to be the slightest indication for it, to a series of cases in any one of the general wards, all of which were practically filled with patients suffering from fever of a remittent or continued type. At the same time I made it known that I was ready and anxious to examine the blood of any patient known or suspected to be suffering from malarial infection. These examinations, with the results, are shown in tabulated form in Appendix A.

On September 12 I visited the hospital of the Third Division, Seventh Army Corps.

The first ward studied was under the charge of a contract surgeon from Indiana, who had been so much impressed by the assertions of the local physicians as to the prevalence of malarial disease that he regarded all of his cases as malarial, and treated them without discrimination as such. No temperature charts or records of the histories of the cases were kept by him, and he had no data to offer beyond the date of admission to hospital. Upon eliciting histories from the patients in his presence and pointing out the rose spots and other diagnostic signs of typhoid fever, he admitted that some of the cases "might be typhoid fever, but was confident there was a strong malarial element in all of them." To eliminate this he was administering to all classes of patients, both mild and severe, 4 drams of Warburg's tincture every four hours.

The cases in this ward were so clearly typhoid fever and not malarial that fresh-blood examinations were not made, and drops were taken for the Widal test only from 7 of the least typical ones. For the results, see cases 1 to 7, Appendix B.

The next ward visited was under the charge of a volunteer medical officer. He was in doubt about the diagnosis of many of his patients, but was confident many of them were malarial. He was preparing carefully written histories and temperature charts of all his cases. He volunteered the statement, however, that nearly every one of his fever patients had been bitten by some unknown insect, but the bites he said were not at all like the rose spots of typhoid fever. He could not name or describe the insect, nor could he explain why the so-called "bites" appeared only upon the trunk and seldom or never upon the extremities. Examination disclosed the characteristic roseola, and the histories and symptoms of the patients all pointed to typhoid fever, in mild as well as severe forms. Examination of the blood in nearly all of these cases was clearly not called for, so plainly were the diagnoses established by a clinical examination. Drops of blood were taken from a few (6) of the least typical cases at the surgeon's request. Three of them were doubtful cases, and the others were supposed to be cases of malarial fever. I drew blood from only 13 patients at this division hospital, applying the Widal test to all of them, and in two instances the fresh blood was examined for malarial parasites with negative result. Of the 13 tests for the typhoid reaction, 12 proved positive and only 1 negative, and the patient from whom the negative specimen was procured showed the unmistakable roseola. A local morning paper had reported the death in this hospital of a private, William E. Ikard, Company K, Second Mississippi, from malarial fever, and this had excited the hope that I would find some cases of malaria. It so happened that the gentleman who reported the insect bites had made the autopsy in this case, and he assured me that he had found the lesions of typhoid fever. He said that the abdominal cavity had contained a brownish colored material and that the gall bladder had entirely disappeared; not a vestige of it could be seen. He had come to the conclusion that the organ had been enormously distended and had ruptured. It seems more probable that the case was one of intestinal perforation with hemorrhage into the cavity of the abdomen.

The third ward visited was in charge of a contract surgeon with a foreign accent, but who had received his medical education in the United States. I asked him if his ward contained any cases of malarial fever, to which question he replied very promptly and with emphasis, "Not one." Upon further interrogation he stated

that of the 50 patients under his control 46 were typhoid fever and 4 as yet undetermined. His cases differed not at all from those in the adjoining wards, and it was truly refreshing to meet such a man whose confidence showed that he spoke from firm conviction. It was not necessary to wake him from an afternoon siesta; unlike the Indiana gentleman his coat was removed and he appeared to be very busily engaged with his patients.

On September 13 I visited the First Division Hospital, Surgeon Munday temporarily in charge. I inquired for any cases of malarial fever, but none could be found, though I heard the diagnosis "malarial remittent fever, mild form," called several times in the office by men who appeared to be comparing monthly reports of sick and wounded. I was told that the cases were chiefly typhoid fever, dysentery, and diarrhea. I was taken to one patient whose diagnosis was regarded as doubtful, probably a case of malarial fever.

Frank Oesker, Company A, First Alabama, admitted to hospital September 7, sick for about eight days previously. There were several small rose spots, disappearing on light pressure, over the chest and abdomen. It was supposed that a segmenting malarial parasite (vacuolated leucocyte?) had been seen in the patient's blood that morning. I did not think it necessary to examine the fresh blood for malarial parasites, but obtained a drop or two for the Widal reaction. Tested next morning, it gave a positive reaction. This was the only case of continued or remittent fever, so far as I could learn, that was not recognized as typhoid fever.

Three cases of supposed malarial fever were brought into the hospital from one of the regiments during my visit. They were cases recently admitted to sick report and had not as yet been treated in bed.

1. C. Dillon, Company F, First Texas. Has been ailing for about a month; he had diarrhea for some time. He had a chill yesterday, and had taken no quinine since the chill. Examination for malarial parasite, negative; Widal test, negative.

2. George Ramsey, Company D, First Texas. Sick about two and one-half days. Has had no chill, but has felt badly for two days before going on sick report. Took 6 grains of quinine to-day at 1 p. m. Examination for malarial parasite, negative; Widal test, negative.

3. Ross Woodward, Company F, First Texas. Has been sick a day and a half. Has had only fever; no chill and no sweating. Has not taken any quinine. Examination for malarial parasite, negative; Widal test, positive.

It is remarkable that 1 case in 3 gave a positive reaction so early in the disease, and it recalls 3 similar supposed cases of malaria, which were all the cases of fever I could find at the camp of the Twelfth Pennsylvania Infantry at Camp Alger. They were all sick in quarters only, and were believed to be convalescent from mild attacks of malarial fevers. I transcribe verbatim from my notes made at the time:

"CAMP ALGER, August 24, 1898.

1. William A. Garman, Company E, Twelfth Pennsylvania. Chilly sensations followed by fever is the only history. Examination for malarial parasites, made at once, negative. August 25, 1898, Widal test, positive; good reaction.

"2. Harry C. Riebsan, Company E, Twelfth Pennsylvania. Has had a number of frank chills, followed by fever and sweating. This was the history given by the man himself, who said he had had regular ague shakes. Examination for malarial parasites, made at once, negative. August 25, 1898, Widal test, positive reaction; typical.

"3. Herbert W. Steward, Company E, Twelfth Pennsylvania. Gives a history of chilly sensations, followed by malaise and a mild fever. Examination for malarial parasite, made at once, negative. August 25, 1898, Widal test, negative."

It is worthy of note that in a camp of a whole regiment the 3 cases came from the same company.

To return to Camp Cuba Libre. Having been told by the chief surgeon of the Third Division Hospital that a considerable number of cases of malarial fever had been reported by the medical officer of the Second Volunteer Cavalry, I made a special trip to the camp of that regiment, September 14, for the purpose of examining any cases of malaria that could be found. I saw the junior medical officer, who stated that he had sent a patient to hospital an hour previously who, he was certain, was a case of malarial fever, and to whom quinine had not been administered. Besides this patient the captain (medical officer) showed me another patient diagnosed malarial fever, and these were all that he had of that class of cases.

1. Evan Jones, Troop H, Second Volunteer Cavalry, just admitted to hospital. Has been feeling badly for two weeks. Gives a history of pains in back and limbs, diarrhea, soreness of bowels. His tongue is coated and the edges are bright red. Roseola is present. Widal test, negative.

2. N. E. Demsey, Troop L, Second Volunteer Cavalry, admitted to hospital September 13; to quarters, September 10. History of headache and insomnia. Tongue coated and with bright-red edges. Examination for malarial parasites, negative. Widal test, negative.

Failure to obtain a positive reaction with the typhoid bacillus early in the disease is no evidence that the patient is not suffering from typhoid fever. On the other hand, a failure to find any of the parasites of malaria, with the absence of pigmented leucocytes, is positive evidence that the patient is not suffering from malarial infection at the time the examination is made. The uniformity of the results obtained in this work has been a revelation to me, and I am more than ever impressed with the great value of the Widal test in clearing up the diagnosis in doubtful and especially in atypical cases of typhoid fever, provided, of course, the test be not ap-

plied too early in the course of the disease. I have been impressed also by the fact that cases apparently those of malarial fever, and in which I expected to find the parasites, were absolutely negative in that regard and gave a positive reaction for typhoid fever. I regard the fact as conclusively proven, by the reports hereto appended, that the fever prevailing among the troops at Camp Cuba Libre was typhoid fever pure and simple. Many of the cases were ambulatory ones; in others the fever was of an ephemeral type. I do not make the statement that isolated cases of malaria did not exist at the time of my visit, but I am positive in the assertion that no single case of continued or remittent fever that came under my observation was due to malarial infection, for with the means at hand of making an absolutely certain diagnosis by examination of the fresh blood I failed to discover a single parasite.

I invited Capt. George P. Peed, assistant surgeon, Fourth Virginia Volunteer Infantry, who is a graduate of the University of Virginia and a postgraduate student of the medical department of the Johns Hopkins University, to accompany me in my visits to the First and Third Division hospitals, and he can bear me out in any of the general or specific statements made herein. As he was made familiar with the practical application of the Widal test and observed a number of my preparations under the microscope, he can also testify in a general way to the constancy with which a positive result was obtained.

I was accorded every facility for the prosecution of my work by the surgeon in charge of the Second Division Hospital, who placed a hospital tent, with tables and other conveniences, at my disposal.

Very respectfully, your obedient servant,

(Signed) JAMES CARROLL,
Acting Assistant Surgeon, U. S. Army.

APPENDIX A.

Blood examinations made at Second Division Hospital, Camp Cuba Libre, Jacksonville, Fla., September 6, 1898, etc.

No.	Name.	Company.	Regiment.	Widal test.	Malaria.	History, etc.
1	Wm. A. Netson.....	A.....	Second New Jersey.....	Positive.....	Not made.....	Admitted August 25. In quarters four days.
2	C. Van Fleet.....	C.....	do.....	Negative.....	do.....	Admitted August 26. In quarters three days.
3	R. C. Inman.....	A.....	First Wisconsin.....	Positive.....	do.....	Admitted August 30. In quarters two days. Typical case.
4	Wm. O'Neil.....	L.....	Second New Jersey.....	do.....	do.....	Admitted August 25. In quarters five days.
5	Jno. Hardy.....	B.....	do.....	do.....	do.....	Admitted August 23.
6	Wm. Kraagranger.....	L.....	First Wisconsin.....	do.....	do.....	Sick three and one-half weeks; convalescent.
7	Herbert Mason.....	B.....	Second New Jersey.....	do.....	do.....	Admitted August 24. In quarters five days. Hemorrhages.
8	Jas. Wolfender.....	E.....	Second Virginia.....	do.....	do.....	Admitted August 29. In quarters six days. Temperature, normal.
9	Theo. Rosche.....	B.....	Fiftieth Iowa.....	do.....	do.....	Admitted August 31. In quarters three days. Temperature, never above 103°.
10	Chester Baxter.....	L.....	do.....	do.....	do.....	Admitted September 1. Temperature, 104°.
11	C. C. Rusk.....	E.....	Forty-ninth Iowa.....	do.....	do.....	Admitted August 18. Typical case.
12	Hans Endested.....	I.....	do.....	Negative.....	do.....	Admitted September 5 (yesterday). In early stage epistaxis. Temperature, 104° last night; 101° this morning. Impairment of motility and a suspicious tendency to agglutination on the part of a very few of the bacilli. I tried to obtain another specimen later, but could not locate the man.
13	M. Bergmeister.....	E.....	do.....	Positive.....	do.....	Admitted August 18. Typical.
14	Chas. Nevins.....	K.....	do.....	do.....	do.....	Do.
15	L. E. Dautremont.....	L.....	Fiftieth Iowa.....	do.....	do.....	Admitted August 18. Has had diarrhea; mild case.
16	Harry Rhea.....	C.....	Forty-ninth Iowa.....	do.....	do.....	Admitted September 3. In quarters five days.
17	Regan Connor.....	G.....	First North Carolina.....	do.....	Negative.....	Admitted September 1. In quarters seven days. The doctor in charge says he has a frank chill, with regular ague shakes every other day. Tongue looks like typhoid.
18	Wm. E. Bryan.....	K.....	Fiftieth Iowa.....	do.....	do.....	Admitted August 17. Sick in quarters two weeks before. Regarded as a doubtful case.
19	Thos. Smock.....	D.....	Ninth Illinois.....	do.....	do.....	Sick nearly two months; two or three weeks of the time in quarters doing light duty. Taken sick on second or third day after his arrival with malaise and fever, with sweating. Never had a chill. Was shown to me as a probable case of malaria.
20	T. G. Lawson.....	Reserve Ambulance Corps.....	do.....	do.....	Not made.....	Admitted August 31. Sick one week before. Maximum temperature, 102°.
21	A. J. Lane.....	E.....	Ninth Illinois.....	do.....	do.....	Admitted September 5. Sick three weeks before. Temperature, normal.
22	Geo. Pagewood.....	G.....	Second New Jersey.....	do.....	do.....	Admitted July 29.
23	Alex. Cody.....	B.....	Second Illinois.....	do.....	do.....	Admitted August 22. Tongue pale and coated; nowhere red.
24	G. W. Thomas.....	D.....	Fiftieth Illinois.....	do.....	do.....	Admitted August 22. Sick three weeks before.
25	Wm. Fisher.....	B.....	Fiftieth Iowa.....	do.....	do.....	Admitted August 25. Sick four days before. Tongue uniformly red. Mild case.
26	L. J. Dettman.....	L.....	Second Illinois.....	do.....	do.....	Admitted August 7. Hemorrhages.
27	George Keagle.....	B.....	do.....	do.....	do.....	Admitted August 11. Severe case.
28	Edgar De Witt.....	A.....	Second New Jersey.....	do.....	do.....	Admitted August 28. Typical case; not severe.
29	Jas. Ocacek.....	Band.....	Second Illinois.....	Incomplete; numerous clumps next morning.	do.....	Admitted August 14.
30	W. Raymond.....	E.....	Forty-ninth Iowa.....	Positive.....	do.....	Admitted August 24.
31	H. N. Williams.....	D.....	First Wisconsin.....	do.....	do.....	Admitted August 23. Hemorrhages, tympanites, delirium, etc.
32	Wm. Sergei.....	B.....	do.....	do.....	do.....	Admitted August 23.

Blood examinations made at Second Division Hospital, Camp Cuba Libre, Jacksonville, Fla., September 6, 1898, etc.—Continued.

No.	Name.	Company.	Regiment.	Widal test.	Malaria.	History, etc.
33	Alex. W. Nelson.....	D.....	First Wisconsin.....	Incomplete; a few clumps next morning.	Not made...	Admitted August 26.
34	Harmen Fullis.....	B.....	.....do.....	Negative (September 8). September 16, positive.	.....do.....	Admitted August 24.
35	Chas. Peterson.....	K.....	Second New Jersey...	Negative two hours. Distinctly positive next morning.	.....do.....	Admitted September 4. In quarters four days.
36	Earl Shaw.....	G.....	Forty-ninth Iowa.....	Positive.....	.....do.....	Admitted September 6. Very sick eight days previously.
37	B. Anderson.....	B.....	First Wisconsin.....	.....do.....	.....do.....	Admitted August 14.
38	T. E. McDonald.....	G.....	Forty-ninth Iowa.....	Incomplete; numerous small clumps present next morning.	.....do.....	Admitted September 6.
39	Walter Sharp.....	B.....	Fiftieth Iowa.....	Positive.....	.....do.....	Admitted August 11. Convalescing.
40	Glen Garlock.....	B.....	First Wisconsin.....	.....do.....	.....do.....	Admitted August 19.
41	P. B. Beamer.....	Reserve Ambulance Corps.	.....do.....	.....do.....	.....do.....	Admitted August 31. Had two chills.
42	A. Richardson.....	D.....	First Wisconsin.....	.....do.....	.....do.....	Admitted August 26.
43	Ira Noel.....	B.....	.....do.....	.....do.....	.....do.....	Do.
44	Chas. Lowell.....	L.....	.....do.....	.....do.....	.....do.....	Admitted August 19.
45	Isaac Laidley.....	K.....	Second Alabama.....	.....do.....	.....do.....	Admitted September 4. In quarters five days previously. Has had malaise one month. Tongue uniformly pale and slightly coated.
46	J. D. Moncure.....	M.....	Fourth Virginia.....	.....do.....	.....do.....	Admitted August 23. Typical.
47	Chas. W. Ernst.....	M.....	Second New Jersey.....	.....do.....	.....do.....	Admitted September 7. Three hemorrhages. Sick with malaise some time before admission.
48	Martin Jansen.....	L.....	First Wisconsin.....	.....do.....	.....do.....	Admitted August 23.
49	A. Czarnecki.....	K.....	.....do.....	Negative; again negative September 16.	.....do.....	Admitted August 23. Mild case. September 16, Doctor Rossiter is quite certain this case is one of typhoid fever.
50	Thos. Hession.....	L.....	Fourth Virginia.....	Positive.....	.....do.....	Admitted August 6. Typical, mild case.
51	Jno. Bartholomew.....	D.....	Fiftieth Iowa.....	.....do.....	.....do.....	Admitted August 22. Temperature high at first.
52	L. Brant.....	L.....	First Wisconsin.....	.....do.....	.....do.....	Admitted August 23. Typical.
53	Wylie Snow.....	H.....	Second Virginia.....	.....do.....	.....do.....	Admitted August 24. Diagnosed malarial remittent.
54	John Grant.....	B.....	First Wisconsin.....	.....do.....	.....do.....	Admitted August 15. Temperature not above 101°.
55	Walter Bauman.....	L.....	.....do.....	.....do.....	.....do.....	Admitted August 20. Convalescent.
56	Geo. H. Mundell.....	E.....	Fiftieth Iowa.....	.....do.....	.....do.....	Do.
57	H. B. Bates.....	M.....	Fourth Virginia.....	.....do.....	.....do.....	Admitted August 23. Typical; severe case.
58	Eustace Hundley.....	L.....	.....do.....	.....do.....	.....do.....	Admitted September 5. Sick about three weeks. Relapse.
59	Henry A. Barclay.....	Reserve Ambulance Corps.	.....do.....	.....do.....	.....do.....	Admitted August 7. Temperature this morning, 104°.
60	Barton Connor.....	F.....	Ninth Illinois.....	.....do.....	.....do.....	Admitted August 18. Roseola.
61	Ora Bennett.....	L.....	Forty-ninth Iowa.....	.....do.....	.....do.....	Admitted September 6. Sick twelve days before.
62	Albert Rinke.....	M.....	First Wisconsin.....	Incomplete; next morning positive.	.....do.....	Admitted August 22. Unusually low temperature. Taking 35 to 40 grains quinine daily.
63	W. R. Gompf.....	Signal Corps.....	.....do.....	Incomplete.....	.....do.....	Admitted August 19.
64	Orson Lyle.....	A.....	Second New Jersey.....	Positive.....	.....do.....	Admitted August 28. Sick one week before. Has had diarrhea for some time.
65	E. C. Weingarden.....	B.....	Fiftieth Iowa.....	.....do.....	.....do.....	Admitted August 14. Typical.
66	G. F. Higgins.....	H.....	Fourth Virginia.....	Negative; impaired motility only.	.....do.....	Admitted September 6.
67	Henry Boyles.....	Reserve Ambulance Corps.	.....do.....	Negative.....	Negative.....	Not on sick report. Is doing duty. Malaise for about two weeks. Temperature last evening, 103°; this morning, 100.5°.
68	Allan Gordon.....	K.....	Forty-ninth Iowa.....	September 11, incomplete.	.....do.....	Admitted four days ago. In quarters one week. Headache, epistaxis, black vomit, tarry stools. Pulse, 50 to 60. Temperature subnormal; persistent hiccup; no jaundice; mind cloudy; died two days later. Autopsy showed typhoid lesions, with a well-marked acute nephritis. No perforation. Urine had shown one-third albumin. Stomach contained blood. Intestine injected.
69	Lieutenant Bell.....	.....	.....	Positive.....	Not made.....	Being treated at a hotel in the city of Jacksonville by Major Pilcher.
70	Jno. R. Van Ness.....	First lieut.	First North Carolina.....	Negative.....	Negative.....	Not on sick report. Is doing duty. Headache, anorexia, soreness of the bowels for several days. Four days later I heard that his condition was about the same and that appendicitis was suspected.
71	Henry Heffens.....	L.....	Second Illinois.....	Doubtful case; morning positive, with well-marked, distinct clumps.	.....do.....	Admitted to hospital to-day. In quarters ten days. Headache; pain in back and limbs. Chill every other day, with fever and sweating. Diarrhea yesterday. Supposed to be malarial. Examination requested.
72	Gus Moore.....	F.....	Ninth Illinois.....	Negative.....	.....do.....	Admitted September 11. In quarters six days. Felt badly nine days before going on sick report. No eruption. Tongue slightly coated, tip and edges red. No quinine. Temperature when admitted (yesterday), 104.5°; this morning, 102°. Examination requested. Suspected malarial case.
73	D. M. Beshtetoor.....	C.....	Second New Jersey.....	Positive.....	.....do.....	Supposed case of intermittent fever. Admitted two days ago. Sick ten days to two weeks previously. No distinct chill. History of shivering sensations at irregular intervals, followed by fever and sweating. Said to have had no quinine, but the record shows he has taken gr. v q. four hours.
74	Fred Saner.....	G.....	Ninth Illinois.....	.....do.....	Not made.....	Admitted yesterday (September 15). Sick one week. Has had rigors, with fever and sweating. Is slightly icteric and has a faint general eruption.
75	Sig. Opperman.....	.....	.....	.....do.....	.....do.....	September 2, was convalescent in measles ward and operated on for appendicitis September 9. Temperature rose to 105°. Wound open and clean. Diagnosed typhoid fever, but reaction negative. September 16, positive reaction confirms Doctor Whiting's diagnosis.
76	Richard Tyer.....	D.....	Ninth Illinois.....	.....do.....	.....do.....	Admitted September 15 (yesterday). Sick eight days. Chill and fever. Tongue coated, edges bright red. General small papular eruption absent from face.
77	Andrew Burthe.....	M.....	Fourth Virginia.....	.....do.....	.....do.....	Taken sick with headache, nausea, pains in back, abdominal tenderness. Sick twelve days. Highest temperature, 102.4°. Generally 100° at night. Normal for the last four days. Very mild case. Examination requested to make diagnosis. Doubtful case.

NOTE.—The absence of remarks in the column for "History, etc.," means that the entry would have been a simple repetition of the history and signs of typhoid fever, including in the majority of instances the roseola, either present or reported as having been observed previously.

APPENDIX B.

Blood examinations made at First and Third Division hospitals, Camp Cuba Libre, Jacksonville, Fla., September 12, 1898.

No.	Name.	Company.	Regiment.	Widal test.	Malaria.	History, etc.
1	R. J. Riley	L	Sixth Mississippi	Positive	Not made...	Admitted September 7. Diagnosed malaria. Sick five days before. Tongue coated; glistening around eyes.
2	T. B. Lee, jr.	E	First South Carolina	do	do	Admitted September 6. Had diarrhea previously. Diagnosed malaria.
3	C. H. Peters	B	Second Cavalry	do	do	Admitted September 6. Sick several days before. Roseola. Regarded as a doubtful case.
4	H. M. Troutt	F	Third Nebraska	do	do	Admitted September 4. Malaise previously. Roseola. Another doubtful case.
5	W. J. Cook	G	Fourth Illinois	do	do	Admitted September 12. In quarters five days. Epistaxis; diarrhea. Taking Warburg's tincture also.
6	C. Augusten	D	Third Nebraska	do	Negative	Admitted August 31. In quarters five days. Diarrhea. Diagnosed malarial remittent.
7	Thos. W. Drysdale ..	F	Sixth Mississippi	do	do	Admitted September 10. In quarters two days. Supposed to be malarial.
8	R. E. Hinton	K	Second Mississippi	do	Not made...	Doubtful case.
9	Thos. Woodhall	N. e. staff.	Second Cavalry	do	do	Doubtful case. Admitted August 31. In quarters four days.
10	A. G. Faulkner	A	First South Carolina	do	do	Doubtful case. Admitted August 30. Diarrhea.
11	W. Danbury	L	Fourth Illinois	Negative	do	Doubtful case. Roseola. Admitted September 3. In quarters eight days.
12	B. R. Bross	G	Second Cavalry	Positive	do	Doubtful case. Epistaxis and diarrhea. Admitted August 30.
13	J. Jansen	D	Third Nebraska	do	do	Doubtful case. Admitted September 8. In quarters three days. Malaise, diarrhea, pain in bowels, roseola. Not diagnosed.

In this connection we have endeavored to trace the protective influence which the supposed malarial fevers would confer upon the enlisted men of the Second and Third Divisions of this corps. The following tables give the result of our investigations:

Table showing cases of typhoid fever among men with and without preceding malarial diseases in the Second Division of the Seventh Army Corps, at Jacksonville, Fla.

Regiment.	Mean strength.	Cases of malaria.		Cases of malaria followed by typhoid fever.	Number of men without preceding malaria.	Typhoid cases without preceding malaria.		Total cases of typhoid fever.
		Number of cases.	In 100 malarial cases.			Number of cases.	In 100 men who have not had malaria.	
Second Illinois	1,095	162	9	5.5	933	272	29.2	281
Ninth Illinois	1,288	217	11	5.1	1,071	189	17.6	200
Forty-ninth Iowa	1,236	235	11	4.7	1,001	461	46.05	472
Fiftieth Iowa	1,097	149	2	1.3	948	194	20.5	196
Second New Jersey	1,153	216	13	6	937	230	24.5	243
First North Carolina	1,164	120	5	4.2	1,044	190	18.2	195
Second Virginia	1,220	109	1	.9	1,111	120	10.8	121
Fourth Virginia	1,274	308	21	6.8	966	151	15.6	172
First Wisconsin	1,232	160	8	5	1,072	237	22.1	245
Total	10,759	1,676	81	4.8	9,083	2,044	22.5	2,125

That is, of 1,676 individuals who had been treated for malarial fever 81, or 4.8 per cent, subsequently had typhoid fever. Of 9,083 individuals who had not been treated for malarial fever 2,044, or 22.5 per cent, had typhoid fever.

Or, of 2,125 cases of typhoid fever 81, or 3.8 per cent, had previously been treated for malarial fever. Of 2,125 cases of typhoid fever 2,044, or 96.2 per cent, had not been treated for malarial fever.

Table showing cases of typhoid fever among men with or without preceding malarial diseases for seven regiments of the Third Division of the Seventh Army Corps at Jacksonville, Fla.

Regiment.	Mean strength.	Cases of malarial fevers.		Cases of typhoid fever preceded by malaria.	Number of men without malarial diseases.	Cases of typhoid fever without preceding malaria.		Total cases of typhoid fever.
		Number.	In 100 men with preceding malaria.			Number.	In 100 individuals without malaria.	
Fourth Illinois	1,194	200	3	1.5	994	235	23.6	238
One hundred and sixty-first Indiana	1,304	299	7	2.3	1,005	127	12.6	134
Second Mississippi	1,217	614	10	1.6	603	108	17.9	118
Sixth Missouri	1,149	176	7	3.9	973	279	28.6	286
Third Nebraska	1,262	307	6	1.9	955	274	28.6	280
Second South Carolina ..	945	537	6	1.1	408	79	19.3	85
Second U. S. Volunteer Cavalry	919	233	7	3.0	686	144	20.9	151
Total	7,990	2,366	46	1.9	5,624	1,246	22.1	1,292

Of 2,366 individuals who had been treated for malarial fever, 46, or 1.9 per cent, subsequently had typhoid fever. Of 5,624 individuals who had not been treated for malarial fever, 1,246, or 22.1 per cent, had typhoid fever.

Or, of 1,292 cases of typhoid fever, 46, or 3.5 per cent, had previously been treated for malarial fever. Of 1,292 cases of typhoid fever, 1,246, or 96.5 per cent, had not been treated for malarial fever.

Combining the above tables for the Second and Third Divisions, we see that of 4,042 individuals who had been treated for these supposed malarial fevers, only 127, or 3.1 per cent, subsequently had typhoid fever, whereas, of 14,687 soldiers who had not experienced

these milder fevers, not less than 3,290, or 22.4 per cent, afterwards contracted typhoid fever.

These tables, taken in connection with Doctor Carroll's careful observations, serve to indicate the slight part played by malaria in the fevers at Camp Cuba Libre.

RELATION OF INTESTINAL DISORDERS TO TYPHOID FEVER.

Our investigations on this point agree with the results obtained in our study of the regiments of the Second Army Corps as shown in the following tables:

Table showing cases of typhoid fever among men with and without preceding diarrheal diseases in the Second Division of the Seventh Army Corps at Jacksonville, Fla.

Regiment.	Mean strength,	Cases of diarrheal diseases.		Cases of diarrheal diseases followed by typhoid fever.		Number of men without preceding diarrheal.	Cases of typhoid fever without preceding diarrheal.		Total cases of typhoid fever,
		Number.	Number of individuals,	Number.	In 100 men with preceding diarrheal,		Number.	In 100 men not having had diarrheal,	
Second Illinois.....	1,095	294	255	26	10.2	840	255	30.4	281
Ninth Illinois.....	1,288	283	245	9	3.7	1,043	191	18.3	200
Forty-ninth Iowa.....	1,236	220	202	24	11.8	1,034	448	43.3	472
Fiftieth Iowa.....	1,097	162	160	8	5	937	188	20.1	196
Second New Jersey.....	1,153	216	202	35	17.3	951	208	21.9	243
First North Carolina.....	1,164	485	435	27	6	729	168	23	195
Second Virginia.....	1,220	167	146	14	9.6	1,074	107	9.9	121
Fourth Virginia.....	1,274	188	171	17	10	1,103	155	14	172
First Wisconsin.....	1,232	39	37	4	10.8	1,195	241	20.2	245
Total.....	10,759	2,054	1,853	164	8.8	8,906	1,961	21.9	2,125

That is, of 1,853 individuals who were treated for intestinal disorders, 164, or 8.8 per cent, subsequently

had typhoid fever. Of 8,906 individuals who had not been treated for intestinal disorders, 1,961, or 21.9 per cent, had typhoid fever.

Or, of 2,125 cases of typhoid fever, 164, or 7.7 per cent, had previously been treated for intestinal disorders. Of 2,125 cases of typhoid fever, 1,961, or 92.3 per cent, had not been treated for intestinal disorders.

Table showing cases of typhoid fever among men with or without preceding diarrheal diseases for seven regiments of the Third Division of the Seventh Army Corps at Jacksonville, Fla.

Regiment.	Mean strength.	Cases of diarrheal diseases.		Cases of diarrheal diseases followed by typhoid fever.		Number of men without diarrheal diseases.	Cases of typhoid fever without preceding diarrheal diseases.		Total cases of typhoid fever.
		Number.	Number of individuals.	Number.	In 100 men with preceding diarrheal diseases.		Number.	In 100 individuals without preceding diarrheal diseases.	
Fourth Illinois.....	1,194	137	115	0	0.0	1,079	238	22.0	238
One hundred and sixty-first Indiana.....	1,304	145	133	9	6.7	1,171	125	10.6	134
Second Mississippi.....	1,217	563	454	11	2.4	703	107	14.0	118
Sixth Missouri.....	1,149	69	67	10	14.9	1,082	276	25.5	286
Third Nebraska.....	1,262	422	344	56	16.2	918	224	24.4	280
Second South Carolina.....	945	521	365	8	2.1	580	77	13.2	85
Second U. S. Volunteer Cavalry.....	919	513	399	37	9.2	520	114	21.9	151
Total.....	7,990	2,370	1,877	131	6.9	6,113	1,161	18.9	1,292

An examination of these tables shows that those men who had experienced previous diarrheal attacks were much less liable to subsequent attacks of typhoid than those who had not had such intestinal attacks.

Number and per cent of connectable typhoid attacks in tents of ten companies of five regiments of the Second Division of the Seventh Army Corps at Jacksonville, Fla., as deduced from captains' tent lists.

Regiment and company.	Attacks plotted.	Directly connectable attacks in same tent.		Indirectly connectable attacks in next tents.		Company totals, direct and indirect attacks.	
		Number.	Per cent to all plotted attacks.	Number.	Per cent to all plotted attacks.	Number.	Per cent to all plotted attacks.
Forty-ninth Iowa Volunteer Infantry:							
Company D.....	50	34	68.00	7	14.00	41	82.00
Fiftieth Iowa Volunteer Infantry:							
Company I.....	16	4	25.00	4	25.00	8	50.00
Second New Jersey Volunteer Infantry:							
Company A.....	32	7	21.87	11	34.37	18	56.25
Company B.....	46	6	13.04	15	32.60	21	45.65
Company L.....	45	18	40.00	10	22.22	28	62.22
Total.....	123					67	54.47
Fourth Virginia Volunteer Infantry:							
Company E.....	10	4	40.00	4	40.00	8	80.00
First Wisconsin Volunteer Infantry:							
Company C.....	39	26	66.66	5	12.82	31	79.48
Company F.....	11	4	36.36	4	36.36	8	72.72
Company G.....	21	4	19.05	9	42.85	13	61.90
Company K.....	18			7	38.88	7	38.88
Total.....	89					59	66.29
Grand total.....	288	107	37.15	76	26.88	183	63.53

Average interval between diarrheal and typhoidal attacks in same individual in nine regiments of the Second Division of the Seventh Army Corps at Jacksonville, Fla., as deduced from lists of diarrheas preceding typhoid fever.

Regiment.	Number of cases preceding typhoid.	Aggregate days of interval between attacks.	Average days of interval between attacks.	Regiment.	Number of cases preceding typhoid.	Aggregate days of interval between attacks.	Average days of interval between attacks.
Second Illinois Volunteer Infantry	5	48	9.8	Second Virginia Volunteer Infantry	1	9	9.0
Ninth Illinois Volunteer Infantry	3	30	10.0	Fourth Virginia Volunteer Infantry	3	35	11.6
Forty-ninth Iowa Volunteer Infantry	10	135	13.5	First Wisconsin Volunteer Infantry	2	14	7.0
Fiftieth Iowa Volunteer Infantry	1	8	8.0				
Second New Jersey Volunteer Infantry	5	58	11.6	Total	36	385	10.6
First North Carolina Volunteer Infantry	6	48	8.0				

Average interval between connectable typhoid attacks in tents in ten companies of five regiments of the Second Division of the Seventh Army Corps at Jacksonville, Fla., as deduced from captains' tent lists.

Regiment and company.	Attacks plotted.	Direct (same tent) intervals of connectable typhoid attacks.			Indirect (next tent) intervals of connectable typhoid attacks.			Company totals, direct and indirect intervals.		
		Number of intervals between connectable attacks.	Aggregate days between connectable attacks.	Average days between connectable attacks.	Number of intervals between connectable attacks.	Aggregate days between connectable attacks.	Average days between connectable attacks.	Number of intervals between connectable attacks.	Aggregate days between connectable attacks.	Average days between connectable attacks.
Forty-ninth Iowa Volunteer Infantry:										
Company D	50	18	196	10.8	12	135	11.2	30	331	11.0
Fiftieth Iowa Volunteer Infantry:										
Company I	16	2	25	12.5	2	28	14.0	4	53	13.2
Second New Jersey Volunteer Infantry:										
Company A	32	4	50	12.5	10	115	11.5	14	165	11.7
Company B	46	3	41	13.6	10	106	10.6	13	147	11.3
Company L	45	10	115	11.5	13	138	10.6	23	253	11.0
Total	123							50	565	11.3
Fourth Virginia Volunteer Infantry:										
Company E	10	3	33	11.0	3	31	10.3	6	64	10.6
First Wisconsin Volunteer Infantry:										
Company C	39	16	178	11.1	8	76	9.5	24	254	10.5
Company F	11	2	19	9.5	3	24	8.0	5	43	8.6
Company G	21	2	23	11.5	7	67	9.5	9	90	10.0
Company K	18				5	46	9.2	5	46	9.2
Total	89							43	433	10.0
Grand total	289	60	680	11.3	73	766	10.4	133	1,446	10.8

Mortality table of Jacksonville, Fla., relative to typhoid fever and other fevers which may be mistaken for it; from 1895 to 1898, inclusive, deduced from statistics by health office of that city.

[Population, 30,000.]

Cause of death	1895.	1896.	1897.	1898.	Total.
Remittent	22	8	10	5	45
Typhoid	9	5	6	9	29
Malarial	9	7	2	3	21
Typhomalarial	2	4	.....	3	9
Intermittent	4	2	1	1	8
Enteric	5	1	.....	.....	6
Continued	4	1	1	.....	6
Gastroenteric	1	.....	.....	.....	1
Bilious	1	.....	.....	.....	1
Total probable typhoid	57	28	20	21	126
Probable typhoid per 1,000	1.90	0.93	0.66	0.71	.....

Average per year, 1.05.

N. B.—During the four years 2 deaths from brain fever, 1 death from gastric fever, and 1 death from septic fever were also recorded.

ORIGIN AND SPREAD OF TYPHOID FEVER IN THE SEVENTH ARMY CORPS.

This did not differ from the origin and propagation of typhoid fever in the other army corps of which we have already treated, and hence we shall only devote a few words to this subject. In referring to the progress of typhoid fever in the Second Division, which was the first to assemble at Jacksonville, we have shown that

the disease was imported by five regiments of the nine originally constituting this division, and further, that it was just in these regiments that typhoid fever most rapidly developed during June. As the men of those regiments not importing typhoid fever and in which so few cases developed in June had the same opportunity for infection from shallow wells within the vicinity of the camp, we must conclude that the importation of cases of typhoid fever was the most important factor in the origin of this disease in the Second Division. We have also seen that all of the regiments of the First Division arriving from Miami, Fla., imported the disease and that only one of the eight regiments of the Third Division failed to import cases of typhoid fever. The sources of infection were, therefore, plainly internal to the several camps, whatever chances for outside infection there may have been.

With regard to the latter, we call attention to the absence of typhoid fever in Jacksonville during the year 1898, and we give herewith a table showing the slight prevalence of typhoid and other fevers in that city for the years 1895–1898, inclusive. So that we must conclude that, although there may have been individual cases of infection outside of the camp, the chief source of the disease was to be found within the camp. As regards

the propagation of the disease in the several organizations, the regimental histories and graphic charts should be consulted. A careful examination of these will show that typhoid fever, as it appeared in the various regiments of the Seventh Army Corps, consisted essentially of a series of company epidemics, whose discrepancies, both in the time of beginning and in their course and ending, were such as to preclude the assumption of a common, simultaneous, and more or less continuously acting agency as the chief means in the spread of the disease. Propagation of the disease through contamination of the general water supply can be safely excluded.

We have already shown that the method in use for the disposal of excreta differed in the three divisions of this corps, the First Division being provided with flushing troughs, the Second Division with half tubs, and the Third Division with open pits dug in the sandy soil. As these divisions were otherwise placed under similar conditions as to camp sites, water supply, etc., it is interesting to observe that while the morbidity from typhoid fever in the First Division was 150.32 per 1,000 of mean strength, this reached 161.70 per 1,000 for the Third Division and the high figure of 250.30 per 1,000 for the Second Division. It should also be noted that the figures given for the Third Division only embrace cases of recognized typhoid fever and do not include probable cases, such as prolonged malarias, incorrectly so diagnosed. Had the latter been included, the morbidity per 1,000 would have approximated that given for the Second Division.

Hence we see that, with water carriage for its fecal matter, typhoid fever never reached as high a proportion in the First Division, although all of its six regiments arrived in Jacksonville in August, 1898, thoroughly infected with this disease, the result of a previous epidemic at Miami, Fla. With conditions ripe for its propagation the epidemic only assumed moderate proportions in the First Division as compared with its course in the Second and Third Divisions. This we believe was largely due to the prompt removal of excreta and to the lessened chance for fly infection of food and sink infection of the person of the soldier, especially his clothing and shoes.

Relative to the spread of the disease from personal contact in crowded tents, which we have discussed in connection with certain regiments of the Second Corps at Camp Meade, Pa., we have only been able to obtain information on this point in ten companies of five different regiments in the Second Division, Seventh Corps. (For details see histories of these regiments.) These squad groups of the sick, as platted in their tents, would appear to suggest a mode of disseminating infection which more effectively reached and acted upon certain limited groups of men while it passed by others. We believe that this would be entirely compatible with the assumption of a dominating tent, squad, or comrade infection. These observations, taken in connection with our studies of certain regiments in the Second Corps, have led us to the opinion that squad or comrade infection was a very important factor concerned in the propagation of typhoid fever in the Seventh Army Corps.

CHAPTER XIII.

COINCIDENT MALARIA AND TYPHOID FEVER.

Early in the war of the rebellion army medical officers reported the prevalence of a form of fever among the soldiers which differed in some respects from typhoid fever as observed in the Northern States. In December, 1861, a board of medical officers, consisting of Surg. A. N. McLaren, Brigade Surg. G. H. Lyman, and Asst. Surg. M. J. Asch, was appointed to determine "whether it (this fever) should be considered an intermittent or bilious remittent fever in its inception, assuming in its course a typhoidal type or a typhoid fever primarily." The members of this board visited and inspected certain camps and hospitals and obtained information concerning others by correspondence with medical officers. They came to the conclusion that the large majority of the febrile cases then occurring among the troops were "bilious remittent fevers, which, not having been controlled in their primary stage, have assumed that adynamic type which is present in enteric fever."

In 1862 a board of medical officers was convened for the purpose of revising the form of sick report then in use in the Army. One member of this board was Surg. J. J. Woodward. Major Woodward had spent the greater part of the preceding year with the Army of the Potomac and was familiar with the form of fever upon which the previously appointed board had reported. However, his opinion of the nature of this fever was never in accord with the report made by the board of inspection. As has already been stated, this board came to the conclusion that the fever about which so much had been said was a bilious remittent fever which had assumed that adynamic type present in enteric fever; in other words, this board defined the fever as a malarial fever with typhoid symptoms. On the other hand, Major Woodward believed that "the prevailing fevers of the Army of the Potomac were hybrid forms, resulting from the combined influence of malarial poisoning and of the causes of typhoid fever." In accordance with the opinion of Surgeon Woodward, the board appointed to revise the form of sick report then in use in the Army suggested to the Surgeon-General that this fever be known as typhomalarial fever.

It should be clearly seen that there were among the medical officers during the war of the rebellion two

very distinct ideas concerning the nature of the disease which they reported under the name of typhomalarial fever. The idea expressed by the board of investigation, that this was a severe form of malarial fever, was the most widely accepted, and, while the name proposed by Major Woodward was adopted, the opinion of the first board concerning the nature of the disease was the one generally accepted. Thus it happened that the disease was designated as proposed by Woodward, but was defined according to the opinion of the board of inspection. Ever since the first use of the name typhomalarial fever, the majority of physicians in the United States using this name would have defined it as a severe form of malarial fever. However, this was never the opinion of Major Woodward.

In a scholarly paper, read before the International Medical Congress held at Philadelphia in 1876, Major Woodward discussed what we would now call mixed malarial infections. He endeavored to show that malarial infection might modify both typhus and typhoid fevers. It must be admitted that in this paper he brought forward some very interesting and convincing historical evidence of the prevalence of such mixed infection in armies. He states:

Is it wonderful, then, that hybrid forms of disease, exhibiting the ordinary symptoms of malarial and of typhoid fever, variously combined, should long have been observed in this country? In fact, such hybrid forms have long been observed in Europe also. In the first volume of his *Institutes*, published in 1781, Burserius recognized them as a group, "the Porportionata," which he defines as the compound species composed of the synochus (an old name for typhoid fever) and intermittent fever. This union, he says, occurs especially "when intermittent fevers prevail epidemically, or at least constitute the prevailing and stationary disease; for then almost all diseases bearing some resemblance to intermittents, or sporadic or intercurrent fevers, of whatever other kind, are combined with the intermitting fevers." Hermann Schmidt, in his account of the so-called summer fever, which was epidemic throughout Europe during the year 1827, has still more elaborately described as the form of fever then most generally prevailing a combination of intermittent fever with the endemic typhus of Europe (our typhoid fever). He has subdivided the resulting hybrid forms into two chief classes: (1) *Typhus intermittens subintrans*, which he defines as a combination of typhus (our typhoid) and intermittent fever, with a preponderance of the typhus element. (2) *Febris intermittens typhosa*, which he defined as a similar combination, with a preponderance of intermittent fever. I would refer you to his elaborate

treatise for many suggestive details. Naumann has quoted, with approval, the views of Burserius and Schmidt, and mentions corroborative observations by several other writers, to which I might add many more, did the scope of this discourse permit.

Woodward also refers to the studies of the Walcheren fever that prevailed among the English army invading Holland in 1809, as reported by Dawson and Davis.

In the paper referred to, Woodward states:

I never meant this term (typhomalaria) to represent a specific type of fever, but intended it to designate all the many-faced brood of hybrid forms resulting from the combined influence of the causes of malarial fever and of enteric fever.

In another place he states:

And this brings me, at length, to answer the question, Is typho-malarial fever a special type of fever? and I reply unhesitatingly that it is not. I, at least, am free from the blame of that error, if anyone has fallen into it. In my first published account of typho-malarial fever I expressly denied that it could be regarded as a new disease. "Much rather," I said, "should it be considered simply as a new hybrid of old and well-known pathological conditions, in which the exact train of symptoms is as variable as the degree of preponderance attained by each of the several concurring elements." And this is the view which I advocate to-day. The essential point which I desire most to impress upon you is the recognition of the group of hybrids between typhoid fever and malarial fevers.

Furthermore, Woodward advocated the idea that typho-malarial fever was modified in individuals suffering under the scorbutic taint. He says:

Now, when either of the forms of typho-malarial fever which I have described occurred in individuals suffering under the scorbutic taint the symptoms were modified to a degree corresponding to the intensity of the scorbutic condition. The effect of the complication was to increase the tendency to mental and bodily prostration during the disease, to tardy convalescence subsequently, and to increase the frequency of petechial and purpuric eruptions and of hemorrhages from the nose and bowels. Sometimes the characteristic scorbutic condition of the mouth was developed during the progress of the fever when it had not previously made its appearance. When the characteristic typhoid process was developed in individuals laboring under a marked scorbutic taint, the symptoms closely resembled those of spotted typhus. Fatal hemorrhages from the bowels were common in such cases, and on dissection the lower patches of Peyer were found converted into dark red or black pultaceous sloughs of considerable size and thickness. I suppose the scorbutic condition to have modified the typhoid ulceration in such cases just as we often see it modify the condition of superficial ulcerations or of gunshot wounds.

Major Woodward closes the paper above referred to with the following statement:

If I have rightly presented the subject, a just appreciation of the hybrid forms which I have urged on your attention to-day is a matter of grave practical importance, not merely as a question of military medicine, though most important in that connection, for I take it that whenever again hereafter an army, recruited in a comparatively nonmalarial region, shall campaign on malarial soil, these hybrid forms will appear once more in epidemic proportions; but meanwhile, I suppose, in sporadic or endemic wise, we shall continue to have these cases to deal with in civil practice in all the miasmatic regions of our Middle and Southern States, and their ready comprehension is therefore a question of serious moment to every American physician engaged in practice in such localities.

Adopting the nomenclature suggested by Woodward, there were reported to the Surgeon-General's Office, beginning with July 1, 1862, and ending June 30, 1866, 57,400 cases of typho-malarial fever, with 5,360 deaths.

Since the war of the rebellion the physicians of this country have been divided in their opinions concerning the so-called typho-malarial fever. A considerable number of those practicing in the Southern States have continued to use this term, but the majority of these have used this designation to represent what they believe to be a severe form of malarial fever, and have never placed Woodward's interpretation upon the nature of the disease. On the other hand, a large proportion of the physicians practicing in the Northern States have denied the existence of this hybrid infection. It is quite evident that the ultimate solution of this problem had to wait upon the discovery of the plasmodium of malarial fever by Laveran and of the bacillus of typhoid fever by Eberth.

Laveran^a appears to have been the first to record cases of so-called mixed malarial and typhoid infection. In 1884 he reported a case of intermittent fever occurring during convalescence from typhoid fever, and a second case in which the malarial attack immediately preceded and closely followed the attack of typhoid fever. These cases are as follows:

CASE 1.—Soldier; age, 22; admitted to military hospital at Constantine, Algeria, August 2, 1882. In March, 1881, he was said to have had a fever which lasted three days, with herpes labialis. He recovered without quinine.

July 31.—The first symptoms of his disease were malaise, headache, thirst, high fever without chill, and general weakness; fever continued without marked remission until entrance to hospital; temperature 40.8° a. m., 40° p. m. Typhoid condition well marked, slight diarrhea, pain upon pressure in the right iliac fossa. Although the diagnosis of typhoid fever appeared probable, quinine was prescribed for a few days.

The diagnosis of typhoid fever was later fully confirmed, although rose spots were not present.

August 11.—Defervescence beginning.

20th.—Temperature normal; the chart is typical of typhoid fever.

29th.—The patient reported that he had a chill for several days at about 7 p. m.; temperature 39.5° p. m.

30th.—Temperature 37.2° a. m., 38.5° p. m. Examination of the blood made at 8 a. m. shows a large number of pigmented malarial parasites, both free and intracorpuscular; quinine was given.

31st.—Apyrexia; parasites in the blood reduced in numbers; quinine continued.

September 3.—No parasites found. Recovery followed.

CASE 2.—Soldier; age, 23; admitted to hospital January 25, 1883. Previous history of intermittent fever in August, 1882. Present sickness beginning on January 20; characterized by daily chills at 2 a. m.

January 24.—Temperature 40.2° a. m., 38.9° p. m. Anæmia well marked; mucous membranes pale; general emaciation and weakness; anorexia. Examination of the blood at 2.30 p. m., shows pigmented malarial parasites, free and within the blood corpuscles; also pigmented leucocytes; quinine given.

25th.—Temperature 38.2° a. m., 38.4° p. m.; quinine.

^a Laveran: *Traité des Fièvres Palustres*, Paris, 1884.

Under this treatment the parasites disappeared, temperature returned to normal, and appetite increased.

February 8.—Patient complains of inability to sleep; headache and general malaise for two or three days. There has been no chill. Temperature 39.5° a. m., 40.6° p. m. Examination of the blood failed to show malarial parasites. Quinine given.

9th.—Fever continues. Temperature 39.7° a. m., 39.9° p. m.; prostration well marked; general malaise, headache, insomnia, slight diarrhea, and some pain on pressure in the right iliac fossa; quinine continued.

11th.—Temperature 39.3° a. m., 40.3° p. m.; rose spots appeared on the abdomen; quinine discontinued.

15th.—Defervescence beginning.

20th.—Temperature normal on the seventeenth day of the disease.

28th.—Patient anæmic and weak. Examination of the blood shows no malarial parasites. Condition continued to improve until March 8, when a chill occurred at midday followed by fever; temperature rising to 40.3°. Examination of the blood showed malarial parasites of the tertian variety; quinine given. From this time under the use of quinine convalescence was rapid.

In this country, Kinyoun,^a in a study of malarial and typhoid fevers in the United States Marine Hospital, New York, recorded under the title of "entero-malarial fever," cases showing "a combination of malarial and enteric fevers, which clinically presented some deviations from the general course of either disease."

He divided his cases into two groups:

I. Cases in which the symptoms of malarial fever predominate, masking the enteric lesion; 2 cases.

II. Cases in which the symptoms of enteric fever are most prominent; 3 cases.

The following is the history of the cases belonging to the first group:

CASE 1.—Patient taken sick two days before admission, the attack commencing with a chill followed by fever, marked by a remission. A microscopical examination of the blood was made and "a large number of the *plasmodia malarie* was found free both in the serum and within the blood corpuscles. This established the diagnosis of malarial fever of the remittent type." On the fifth day after admission there appeared on his abdomen several suspicious-looking spots suggestive of enteric complications. On the day following he had slight epistaxis, a tendency to diarrhea and tenderness in the right iliac fossa. The case afterwards ran the typical course of typhoid fever. Patient recovered.

CASE 2.—The symptoms were less pronounced than in the first case. "The *plasmodium malarie* was found in the blood in abundance, and later the typhoid bacillus was isolated from the stools."

Concerning the three cases of Group II, the author says: "The enteric symptoms were well marked, giving a clear history of the disease." There were lassitude, etc., "followed by diarrhea, epistaxis, and tympanites, and in one case slight hemorrhage." In these cases the parasite was found "confined to the corpuscle, not free in the blood."

In one of these cases, during the third week when convalescence appeared to have been established and temperature was normal, he had a sudden access of fever two days in succession. Examination showed the *plasmodium malarie*. Patient recovered.

The other cases of this group died, 1 from peritonitis and 1 from pneumonia.

Kinyoun does not record the variety of the parasite found in his cases.

In 1894, W. Gilman Thompson, in a paper before the Association of American Physicians, reported 3 cases of mixed malarial and typhoid infection. The following is taken from Thompson's history of one of his cases:

On his admission his appearance suggested typhoid fever and he was treated accordingly by the Brand method of cold tub bathing. There was slight enlargement of the splenic area of dullness, great prostration, diarrhea, and a typical typhoid tongue, dry, coated on the dorsum, with thin red margins and swollen papillae. There was continued fever, which lasted for seven weeks, and during this period the patient developed the following symptoms: A genuine typhoid eruption, there being some forty distinct rose spots on the abdomen and chest, which appeared in successive groups; hemorrhages from the bowels, of which there were four or five of considerable amount; tympanites, bronchial catarrh, slight albuminuria with granular casts, semistupor and delirium, subsultus, great prostration and emaciation, and the facies of the typhoid condition.

On the thirteenth day of the illness there was a severe chill, lasting about three-quarters of an hour, and so violent that the patient shook the bed. It was accompanied by a rise of temperature to 106.6° F., but there was no sweating. During the third week two other chills occurred of equal violence. As the first took place before the hemorrhage, and also before the eruption became decisive, and as there was nowhere evidence of suppuration, it appeared possible that there might be error in the diagnosis, and the blood was carefully examined for the malarial plasmodium. It was found in exceptionally large numbers in the red corpuscles and also independent of them. When the next chill and exacerbation of temperature occurred quinine was given hypodermically, with the effect of reducing the temperature 4.5° (105.5° to 101° F.). This treatment was several times repeated, and on one occasion at the end of the third week the temperature was temporarily reduced from 106.4° to 99° F. No more chills occurred after the beginning of the fourth week, but the use of quinine was continued by the mouth, and the bathing, previously interrupted by the hemorrhages, resumed. The patient made a good recovery, and after fifty-five days in the hospital was discharged, cured.

With reference to these cases Thompson says:

In the first case reported the plasmodium became active during the height of the typhoid disease. In the second and third cases the malarial symptoms remained latent (although the plasmodium must have been already present) until the force of the enteric infection had been completely expended, when they assailed a body weakened by a fever of considerable duration.

Thompson believes that while it is unwise to accept the term typho-malarial fever as indicating a third form of disease, it can not be denied that the two diseases may coexist.

Osler^a reports three cases in which "there was a definite history of malaria within a few months of the onset of the typhoid fever," and one case in which a patient having malaria subsequently developed typhoid fever. The history of the latter case is as follows:

The patient, a man aged 20, had, during sixteen days prior to admission, headache and cough, occasional nose-bleeding, and three

^a Weekly Abstract of Sanitary Reports, Vol. V, 1890.

^a Johns Hopkins Hospital Reports, Vol. IV, 1895.

chills. On admission, October 16, the temperature was 100°, but fell in the early morning of the 17th to 96°. The malarial parasites were found to be present in the blood. He was ordered quinine, 4 grains, three times a day. On the 17th the temperature began to rise a little after 12 a. m., and at 3.30 p. m. he had a chill, after which the temperature rose to nearly 105°, then fell throughout the next night and was normal at 8 a. m. The case was one of ordinary tertian intermittent, and the quinine was continued. On the 18th, 19th, 20th, 21st, and 22d the temperature was normal or subnormal. A two-hourly temperature had been taken. Up to 8 a. m. of the 22d he had taken 80 grains of quinine. He had no more fever, and the malarial parasites had disappeared from the blood. At 8 a. m. on the 22d the temperature was 97.5°. At 4 p. m. it was 98°. It gradually rose through the evening, and at 12 midnight it was 102.5°. The next morning it was 102.2°, rose throughout the day, and from 4 to 8 p. m. was at 105°, so that within the twenty-four hours, from 4 p. m. on the 22d to 4 p. m. on the 23d, the temperature had risen 7°. Naturally we thought this was a recurrence of malaria, in spite of the administration of quinine, of which he had had 96 grains up to 10 a. m. on the 23d. From 8 p. m. on the 23d throughout the 24th and 25th, the temperature remained practically between 103° and 105°, uninfluenced by the quinine (which was continued), and only influenced slightly by sponging. The quinine was continued until noon on the 26th. The whole appearance of the man was suggestive of typhoid fever, and subsequently spots appeared, the spleen enlarged, and the disease ran a perfectly normal course, typical, but of great severity, the temperature not falling to normal until between the fifth and sixth weeks.

Osler further says:

There was no case with the character of the two diseases so blended that it seemed a compound or hybrid malady, nor was there an instance in which the manifestations of the two diseases were concurrent.

The same author^a records a case of continued malarial fever, lasting from September 28 to October 7, 1894, in whose blood the æstivo-autumnal parasite was found during the attack, and which was followed by a severe typhoid fever, beginning on November 6, or thirty days later. The case ended in recovery.

Vincent,^b a French army surgeon, on duty at the bacteriological laboratory of the Hospital du Dey in Algeria, records 17 cases of mixed malarial and typhoid infection, which he designates as "*fièvre typho-palustre*."

These cases were observed among soldiers who had served in Madagascar and Algeria. Although the clinical picture was a variable one, sometimes partaking of that of malaria and sometimes of that of typhoid fever, as a rule the typhoid symptoms were dominant. The earliest symptoms were manifested by a rise of temperature, with or without chill, severe headache, sometimes epistaxis, and general body pains. Once established, the fever continued, often irregular in its course, or higher in the morning than in the evening. In 2 cases the initial fever was of short duration, and was followed by an almost normal temperature, the latter interrupted by an occasional rise. The pulse followed the oscillations of temperature, remaining in the meanwhile frequent. It often varied from 130 to 150 or more to the minute. It was dicrotic, compressible, sometimes

thread-like, and was accompanied by cardiac distress and irregularity.

Profound stupor, delirium, great excitement alternating with collapse, earthy hue of countenance, dusky, dry lips and tongue, and marked albuminuria, symptoms which indicated the severity of the infection, were to be seen in all of these cases. Sometimes the disease was ushered in by coma like that of pernicious malaria, death occurring during the first week. Thoracic complications (bronchitis and pneumonia) were almost constant. Rose spots were present in 12 cases. Iliac tenderness was present; in some cases constipation. Diarrhea, slight or profuse, was the rule. One patient died with choleric symptoms. Two cardinal symptoms were never lacking—the earthy color of the face and the marked enlargement of the spleen. There were also enlargement and tenderness of the liver.

While death might be caused by the intensity of the infection, it was often in consequence of complications such as myocarditis, parenchymatous nephritis, gangrene of the lung, lobular pneumonia, abscess of the kidney and spleen, peritonitis, etc.

Convalescence was slow and was sometimes marked by isolated paroxysms.

In all of these patients microscopic examination of the blood made during life and at the beginning of the disease showed, in variable numbers, the malarial parasite (amœbic, segmenting forms, and crescents), except in 1 case, in which large doses of quinine had been taken. In this case large numbers of the parasite were found in the tissues of the spleen after death.

Death occurred in 8 of these cases. Swelling or ulcerations of Peyer's patches were found in all, in varying degree. These changes were often slight. Once or twice they were reduced to a simple psorentery (simple psorenterie). The mesenteric glands were enlarged. The spleen constantly increased in size, weighing in one case 700 grams and in another 900 grams, and its surface was of a dark color. The liver was enlarged, of a brown color and soft consistency. The kidneys showed the lesions of parenchymatous nephritis. Sections of the liver showed marked pigmented infiltrations of the capillaries. The same pigmentation, yellow or black, was found in the spleen. Sections of the spleen showed sometimes a large number of malarial parasites and crescents.

In all of the fatal cases cultures from the spleen gave a motile bacillus, which did not liquefy gelatin, and which grew upon potato as a moist, colorless layer. This bacillus grew well in bouillon to which carbolic acid had been added, and did not ferment lactose. It showed all of the characteristics of the bacillus of Eberth.

As the result of the microscopic study of the blood, and of the pathological and bacteriological findings at the autopsy, Vincent concludes that the disease under consideration is "none other than a mixed infection due to the association of the typhoid bacillus and the mala-

^a Johns Hopkins Hospital Reports, Vol. V, 1895.

^b Mercredi Médical, Paris, 1895, pp. 572-579.

rial parasite. Whether the typhoid germ developed secondarily upon a soil already invaded by the malarial poison (which appears to be most frequently the case), or whether the two infections are coincident, they produce by their conjunction a remarkable disease, of hybrid character, sometimes partaking of the nature of remittent-malarial fever and sometimes of that of typhoid fever."

In 1897 Da Costa^a reported 1 case:

Male; age, 25 years; admitted to hospital November 9. Began more than three weeks ago to have chills every second day, followed by high fever and sweating. Has had some diarrhea for two weeks. Upon admission he had continued fever and exhibited features of typhoid fever. Temperature rose to 102.4° in the evening.

10th.—Temperature, a. m., 100°; p. m., 103.8°. Thereafter the fever followed the course of typhoid. There were rose spots and pea-soup evacuations.

Examination of the blood (date not stated) "showed various forms of malarial organisms, though not the crescentic forms."

Lyon^b reported the following observation:

CASE.—Male; age, 48; admitted to Johns Hopkins Hospital January 5, 1898. Well-established history of previous malarial attacks during June, August, and October, 1897. Present illness dates from December 18. Between this and January 5, 1898, he had daily chills, slight, and confined to his back. No sweats, cough, or epistaxis. On admission, temperature, respiration, and pulse normal; tongue dry and coated; abdomen full and rather tense, but not tender; no gurgling in iliac fossæ; a few rose spots on abdomen; bowels constipated; Ehrlich's diazo-reaction in the urine; no malarial organisms in the blood; Widal's reaction absent. During the forty-eight hours following admission two suspicious febrile paroxysms occurred, without chills or sweating. Repeated examinations of the blood for malarial parasites were negative. The case pursued the characteristic course of typhoid fever, and was of average severity. Widal positive. Temperature reached normal on the thirty-first day. Nine days later there was a febrile paroxysm, without chill or sweating. This was followed by a similar paroxysm two days later, and a third paroxysm two days after this. Examination of the blood during the third paroxysm showed numerous full-grown pigmented tertian malarial organisms and a few young hyaline forms in the red-blood corpuscles. Quinine was given in full doses, and no further evidence of malarial fever was seen. The case ended in recovery.

It will now be interesting to inquire whether or not the conditions prevalent among our troops during the late war with Spain have thrown any light upon the so-called typhomalarial fever as defined by Woodward. Let us repeat that Woodward believed that this disease was due to the coexistence of the malarial and typhoid poisons in an individual. He never taught that typhomalarial fever was only a severe form of malarial infection.

We will first record the results obtained by those medical officers who were assigned to general hospitals or to military camps for the purpose of making expert blood examinations.

Acting Asst. Surg. J. J. Curry, U. S. Army, on duty at the general hospital, Fort Myer, Va., to which

hospital many cases were sent from Camp Alger, Va., Jacksonville, Fla., and Montauk Point, N. Y., reports as follows:

We have met in our investigation 12 cases in which both the malarial parasites were found in the blood, and at the same time the Widal reaction was obtained. In but 1 of these cases was the malarial parasite found in the course of the fever of typhoid. This case is of unusual interest, and I will refer to it later. In 8 of the cases the malarial parasite appeared, with accompanying symptoms, during the convalescence. In the remaining 3 cases the soldiers had had typhoid fever from two to six months previously to the malarial attack. At the time the blood of these cases showed the malarial parasite it also gave the Widal. These cases, of course, do not come under the head of mixed infections, but their mention serves to illustrate a possible source of error in cases reported as mixed infections, simply because the Widal was obtained at the same time that the malarial parasite was found in the blood. In 8 of these cases of mixed infection the malarial parasites occurred during convalescence only. In the other case the parasite was found both in the first week of the disease and on the eighteenth day of normal temperature during convalescence. All of these men came from Cuba and had had malaria there. The earliest period at which the malarial attack occurred during convalescence was on the fourteenth day of normal temperature; 1 case on the seventeenth, 1 on the eighteenth day, 1 on the twenty-second day, and the others at varying intervals from one to two months after the temperature had reached normal.

The case in which the parasite occurred during the acute stage of his typhoid deserves special mention. This soldier, a man about 27 years of age, native of Massachusetts, a first-class private, Signal Corps, U. S. Army, was in Cuba with the Fifth Corps during the Santiago campaign.

History.—He had chills and fever at Santiago July and August, 1898; came to Montauk Point, and then to the command at Fort Myer about November 1. On November 17 he had a chill and sharp rise of temperature; blood examination showed double tertian (2 crops of tertian malarial parasites, 1 mature, 1 half grown); his temperature reached normal on the 18th, but on the 20th the temperature was 100°; the temperature rose to 103° on the 22d; blood examination showed the astivo-autumnal parasite on this day; no tertian parasites; Widal, negative. Blood was examined daily: the astivo-autumnal parasites (ovals, crescents, and round bodies) were found in gradually lessening numbers until the 27th day of November, i. e., up to the 8th day of continuous fever, then they disappeared; the temperature came down to normal after nineteen days of fever; the highest point recorded on the temperature chart was 104° on November 27. After repeated examinations for Widal, a positive reaction was obtained on the 25th day of the disease (after the temperature had been normal nearly a week). The man's temperature remained normal until December 26, when he had a sharp chill, the temperature rising to 106°; the temperature fell to normal, but was followed by another chill and rise to 103.4° on the next day. Examination of blood showed double tertian (two crops of the malarial parasite). The first chill occurred after eighteen days of normal temperature.

In these 9 cases the malarial infection was in 5 single tertian, in 2 double tertian, and in 2 double tertian and astivo-autumnal.

We have found malaria complicating, or rather recurring, during the convalescence from other diseases, and even in surgical cases. There appears to be no connection between typhoid and malaria other than that an attack of typhoid fever, by lowering the individual's resisting powers, gives favorable soil for a recurrence of his malaria, or affords a suitable condition for a fresh invasion by the malarial parasite.

Probably careful investigation would reveal the fact that convalescents from diseases other than typhoid show quite as large a percentage complicated by malaria.

^a International Clinics, Vol. II, Seventh Series, July, 1897.

^b American Journal of the Medical Sciences, January, 1899.

Acting Asst. Surg. James Carroll, U. S. Army, who made blood examinations at both Camp Alger, Va., and Jacksonville, Fla., failed to find the malarial parasite in the cases of fever examined by him.

Dock, of Ann Arbor, who was assigned to duty at Chickamauga during the early part of September, 1898, and afterwards visited the camps at Knoxville, Tenn., and Middletown, Pa., sums up the result of his painstaking labors as follows:

I found no evidence of combined typhoid and malarial infection. Among so large a number of cases of typhoid fever in men from all parts of the country some cases of that kind must have occurred.

Dr. James Ewing, who was detailed by Surgeon-General Sternberg to duty at Montauk Point, N. Y., to render what assistance blood examinations might give in the diagnosis of fevers among troops arriving from Cuba, makes the following valuable observations:

In 69 cases giving a distinct history of recent malarial fever and exhibiting similar evidence in the blood in the form of severe anemia, pigmented leucocytes, often atypical pigmented intracellular bodies, and in some cases a few plasmodia, the question of a double infection with typhoid fever and malaria had to be considered.

Of these, 40 were reported as cases of typhoid fever in anæmic and malarious subjects. In some of these cases the disease began with one or more short rigors repeated on successive days, after which the disease progressed with the usual symptoms of typhoid fever. In one such instance (791) tertian parasites were found during the first few days and before typhoid fever was suspected, but they disappeared rapidly under quinine and were not again seen. The patient died from peritonitis in the fourth week.

In another case (514) the usual history of Cuban malaria was interrupted by the development of typhoid fever with all essential symptoms; plasmodia could not be found in the blood, but in the second week of convalescence tertian chills and fever developed and tertian parasites were found in the blood.

In a third case (683) the history indicated the slow onset of typhoid fever in Cuba, which was safely withstood without quinine, but in the second week of convalescence, tertian chills and fever supervened and tertian parasites were found in the blood.

There were other cases (1, 3, 51, 115, etc.) illustrating the same behavior of the malarial infection during the course of typhoid fever.

Further evidence of the usual incompatibility of malarial and typhoid fevers were furnished by the 2 fatal cases of typhoid fever in malarious subjects that came to autopsy (523, 683). There no parasites could be found in the blood during life, but in smears from the spleen and marrow diligent search revealed the presence of a very few rings and crescents, with much old malarial pigment.

The reason why the blood was examined in 159 cases of typhoid fever was the intermittent character of the fever, which was exhibited in patients both with and without malarial antecedents. In no case of undoubted and established typhoid fever were malarial parasites found in the blood in connection with any of these sudden rises of temperature, but only at the onset of the disease or during convalescence.

On the other hand, many patients whose blood contained numerous parasites were seen in the typhoid state, but there were always some essential symptoms lacking to confirm the diagnosis of typhoid fever, while the subsequent course of the disease, where observed, demonstrated the purely malarial character of the fever.

The patients might suffer from epistaxis, hematemesis, bloody stools, tympanites, a few rose spots, though oftener herpes, diarrhea, and delirium, and in some a partial Widal's reaction was obtained. But the intestinal symptoms were inconstant or referable to dysen-

tery or simple diarrhea, from which many of the malarial cases suffered, and these patients never showed subsultus, or cracked tongues, and they did not die; or if they did, dysentery and malaria were demonstrated at or before the autopsy.

In another group of 29 cases the absence of any large number of parasites and presence of typhoidal symptoms left a reasonable doubt regarding the diagnosis.

These cases seemed almost certainly malarial on account of the previous history, the facies, the anæmia, and usually the sudden recovery at the turn of the disease, while in 7 of them a few parasites were found in the blood.

On the other hand, the suspicion of typhoid fever was raised by the continued fever, abdominal symptoms, and general typhoidal state, although symptoms of typhoid fever were not present in distinct and convincing form. A moderate reaction with Widal's test was sometimes obtained in these cases, but this evidence failed to be convincing after sharp reaction had occurred in a case of dysentery (269) and in a cinchonized case of pernicious malaria (328).

It is possible that some of these patients suffered from both active malaria and typhoid fever, but there was no positive indication that the latter infection was present. In the cases that came to autopsy there was never any doubt of the nature of the disease. It was either typhoid fever or malaria, but never both, although microscopical evidence of dormant malarial infection was found in at least 2 cases of typhoid fever.

In short, in spite of every painstaking effort, the attempt to find a case of typhoid fever and active malaria progressing simultaneously was unsuccessful.

From the study of this group of cases it is concluded:

(1) That typhoid fever is to a large extent incompatible with active malarial fever, and that during the course of the former the latter infection is usually suppressed.

(2) That the presence of old malarial infection may alter the course of typhoid fever through the anæmia, but that active sporulation of the malarial parasites very rarely occurs during the course of established typhoid fever.

(3) On the other hand, since malarial paroxysms often reappear during convalescence, a scanty growth of the parasite must often persist during the course of typhoid fever, and it is possible that some of the irregularities of temperature observed in these cases are referable to this partly suppressed growth.

(4) That the anatomical evidence of a post-mortem examination is much needed to demonstrate the existence of typhoid fever in cases showing active malarial paroxysms.

Acting Asst. Surg. Charles Craig,^a U. S. Army, who spent several months at the Sternberg Hospital, Chickamauga Park, Ga., reports a case of combined typhoid and quartan malarial fever, the first case to be placed on record in which the quartan parasite has been found.

History.—Male; malaise, constipation, and headache, with evening temperature of from 101° F. to 102° F. from September 29 to October 5, on which date he was admitted to hospital. The previous evening he had a slight chill. On admission the symptoms were gurgling and tenderness in right iliac fossa; dry, hot skin, and typhoid tongue. Later there were tympanites, epistaxis, and rose spots.

October 12, or about the twelfth day of disease, Widal reaction pronounced.

15th.—Temperature a. m., 100° F., when he had a slight chill with rise of temperature to 103.4° F. Evening temperature 101° F., and for the succeeding two days it ranged from 101° F. and 102° F.

18th.—Seventy-two hours after the first chill a second and severer chill occurred. Examination of the blood showed the

^a The Philadelphia Medical Journal, June 17, 1899.

quartan parasite in abundance. The patient's general condition was markedly worse.

2^{1st}.—A third paroxysm, the temperature rising from 99.2° F. to 104.6° F. This was followed by a fourth and fifth paroxysm on October 25 and 28. Large doses of quinine prevented their return. The case terminated fatally.

Craig's description of the parasite and the chart accompanying the description prove that the organism was of the quartan variety.

Da Costa^a reports 10 cases of typhoid fever among soldiers under treatment at the Pennsylvania Hospital, proved to be such by clinical symptoms and in nearly every instance by the Widal test, in which also the malarial parasite, generally of the tertian variety or of the æstivo-autumnal type, was present.

The soldiers came from Camp Meade, Pa., except one, who had been in Porto Rico.

Da Costa says that attention is nearly always called to the malarial complication by the occurrence of a chill. These chills came on late, and sometimes not until a relapse. In only one instance of the 10 did the chill happen in the early part of the typhoid fever. In 1 case the chill occurred on the twenty-sixth and twenty-eighth days of the disease, and the tertian parasite was found on the latter date. In a second case, "late in the disease, rises of temperature occurred from normal to 100.8°, without chills; the malarial organisms of tertian type were found during these fever rises." In a third, the chill occurred on the fifth day after admission, followed by a temperature of 106°. Tertian parasites in unusual number were found. In a fourth case the chills occurred on the forty-seventh day of the disease; the type of the plasmodium was not well defined.

Da Costa gives, as a striking illustration of late appearance, a case in which it was only during the third relapse and on the eighty-eighth day of the disease after a hard chill that malarial organisms were found. The author's experience teaches him that cases of mixed malarial and typhoid infection are distinguished by chills and by the long duration of the fever.

Muehleck,^b as the result of the careful study of the blood of 90 soldiers admitted to St. Agnes Hospital, Philadelphia, reports the presence of the malarial parasite in 7 instances. Dr. Muehleck has kindly informed us that in all the cases in which the parasite was found the soldiers had come from Porto Rico or Cuba. The period of the disease at which the parasite was found was as follows: During the second week, 1; third week, 1; fourth week, 3; undetermined, 2.

The varieties of the parasite are not stated. They are described as "extracorpuseular or intracorpuseular bodies, which in some instances contained pigment.

^a "Malaria with typhoid fever." The Philadelphia Medical Journal, May 6, 1899.

^b "Results of the examination of the blood of 90 soldiers ill with typhoid at the St. Agnes Hospital." The Philadelphia Medical Journal, May 20, 1899.

These bodies were spherical, irregular in outline, and, as first stated, sometimes contained pigment which, at least in the intracellular variety, was usually gathered in or near the center of the body. In two instances sluggish, amœboid motion was observed, while in the rest the bodies were quite motionless. * * * Evidences of rosette formation or of sporulation were never observed, nor did we ever succeed in finding rings, crescents, or ovoid bodies belonging to the æstivo-autumnal variety."

Withington^a reports 3 cases of typhoid fever coincident with malarial infection and 4 cases of typhoid in which the parasite was found during convalescence. Withington's cases occurred among soldiers who had returned from Cuba; the variety of the parasite was æstivo-autumnal in 6 cases; in 1 the variety is not stated.

The history of one of the coincident infections with malaria and typhoid is as follows:

J. A. F., aged 18, of the Second Massachusetts Volunteers, was sick and in the hospital in Cuba about July 18 with chills and fever. At that time some vomiting and diarrhea, with bloody stools. Came to Montank Point and thence went to his home in Orange, Mass., but did not feel well at either place. About September 10 had chills and fever for five days.

Entered the hospital September 24, at which time he had had no chill for eight days. Some diarrhea, but lately constipation. The enlarged spleen could be felt, and there was a limited number of rose spots. The plasmodia malarie were found. The Widal test was negative on September 30. On the night of October 4 he was seized, while in the act of defecation, with some pain in the abdomen, and the temperature dropped 2°. The next morning the abdomen was found moderately distended, muscles rigid, tympany general except in left flank, where there was dullness. He failed during the day and died at 10.45 p. m., October 5.

The autopsy showed a marked malarial spleen, much enlarged (weight 430 grams), symmetrical, of dark, slate color. The follicles could not be made out; spleen fairly firm, little pulp on scraping; microscopically, much black pigment in the cells. There were also numerous typhoid ulcers, one of which, at a point 55 cm. above the ileocecal valve, had perforated the bowel, causing general fatal peritonitis.

The author also records 4 cases in which, as he states, the probability seems very strong of a typhoid super-vening upon a malaria.

We quote the history of one of these cases.

J. W., aged 25, Seventh U. S. Infantry. Two weeks before leaving Cuba had chills and fever for six days. Recovered. Again chills and fever on transport from Cuba. Felt well while at Montank until September 5. Then malaise, headache, and diarrhea. Entered hospital September 13. Rose spots; Widal reaction positive; no plasmodia. His temperature ran a fairly characteristic typhoid course, becoming normal on October 12. On the 18th a chill while in bath. Temperature rose 3° and returned to normal. No search for plasmodia appears to have been made on this day. For the following week there was some fever, which was supposed to be a recrudescence of the typhoid. A slow recovery with great prostration. The record shows no plasmodia at any time.

^a "Coincident malaria and typhoid infections as seen among our returned soldiers." Report of the Boston City Hospital, 1899.

Concerning these cases, Withington says:

The evidence of primary malarial infection while in Cuba is as strong as it can be without microscopic demonstration, but the malaria was generally in abeyance during the progress of the typhoid, the latter disease running its course in some cases typically, in others more or less atypically.

The author also records 3 cases in which the sequence was (1) malaria, (2) typhoid, (3) malaria, and remarks that "each of these seemed to hold the field alone for the time being, the original malaria becoming dormant while the typhoid was in progress, so that the latter disease was in all respects unmodified, and then with recovery of the typhoid the malaria reasserted itself as before."

The following case is given in illustration:

J. C. G., aged 23, Fourth U. S. Infantry. Had a sudden onset of fever August 25. There were chills, fever, and sweating of daily occurrence. Says he was cured of this at Montauk. Entered hospital September 6. Diarrhea; five or six dejections daily; green to dark; slimy; twice bloody. Pain and tenderness about umbilicus. No plasmodia found. The fever reached normal for one day, September 13; for the next ten days ran about 100°, and on September 22 the Widal test was positive. From September 28 the fever was higher (102°), but had gone by October 6, and the patient was convalescent. October 20 plasmodia were present, the patient having on that day a chill which shook the bed, with temperature nearly to 105°. There was no further manifestation of the disease after this.

From the Massachusetts General Hospital, through the kindness of Doctor Vickery, we are able to report the following cases:

CASE I.—Soldier; age, 28; regular; Cuban service. Admitted August 23, 1898. Widal positive; crescents in blood; afebrile after first day. Diagnosis: Malarial remittent-typhoid, convalescent. Transferred to another hospital. Had another relapse, but whether typhoid or malaria is unknown. Termination unknown.

CASE II.—Soldier; age, 24; regular; Cuban service. Admitted September 6. Widal positive and ovoids on September 10. Diagnosis: Typhoid fever-malarial, remittent. Temperature very irregular; remained subnormal after three days; quinine administered. Recovery.

CASE III.—Soldier; age, 26; volunteer; Cuban service. Admitted September 6. Widal positive; chill on day of entrance with a temperature of 105.5°. Double tertian parasites. Quinine administered with no further rise of temperature. Recovery.

CASE IV.—Soldier; age, 22; regular; Cuban service. Admitted September 13. Widal positive. Symptoms quite typical of typhoid. Tertian (?) parasites; no marked irregularity of temperature due to malaria. Doctor Shattuck thinks the malarial complication probably remittent. Recovery.

CASE V.—Soldier; age, 23; regular; Cuban service. Admitted October 15. Widal positive; tertian parasites in blood; afebrile after first day. Recovery.

Through the kindness of the medical superintendent of the Lakeside Hospital, at Cleveland, Ohio, we are able to report the following cases in which the blood examination was made by Dr. E. P. Carter:

CASE I.—B. P., Company F, Fifth Ohio Volunteers. Blood examination showed both the Widal reaction and the æstivo-autumnal parasite. Death resulted.

CASE II.—J. R., Company A, Fifth Ohio. Blood examination showed both the Widal reaction and the malarial parasite. The form of the later is not stated. Patient recovered.

CASE III.—G. R., Company C, Fifth Ohio. Blood examination showed both the Widal reaction and the plasmodium malarie. The variety of the latter is not stated. Patient recovered.

CASE IV.—C. G., Company B, Fifth Ohio. Blood examination showed the plasmodium and gave Widal reaction. Variety of parasites not stated. Recovery.

CASE V.—A. H., Company L, Fifth Ohio. Blood examination showed the plasmodium and gave Widal reaction. Type of parasite is not stated. Termination not given.

CASE VI.—J. J. F., Battery A. Blood examination showed both the Widal reaction and the æstivo-autumnal parasite. This man developed amœbic dysentery and died.

C. R. Grandy^a (typho-malarial fever) reports two cases:

CASE I.—Had a chill in Santiago; was quite ill, but recovered sufficiently to come to this country; went to Camp Wickoff, Montauk Point, L. I.

August 27.—Had a chill, with temperature 105°.

28th.—Blood contained pigmented tertian parasites. Attack responded to quinine.

September 11.—Patient had a chill.

13th.—Two sets of tertian parasites.

19th.—Widal positive. The fever then ran the course of typical typhoid fever.

October 19.—Fever disappeared.

23d.—Chill, followed by fever and sweat. Malarial organisms were again found in the blood. Malarial parasites preceded the fever, present at beginning, dormant during height, and then returned.

CASE II.—Four days before the patient, a healthy young man, had had a slight chill, followed by fever; the next day there was a remission, but not a complete intermission. The fever then became very irregular, but did not rise above 103° F. Upon examination there was headache, constipation, enlargement of the spleen, temperature of 103° F. Blood examination showed pigmented tertian parasites within the red cells; Widal reaction absent. Quinine was given, and the fever dropped to not quite normal; afterwards it rose gradually and the patient developed a case of typhoid fever, from which he recovered without a return of the malarial symptoms.

In addition to the foregoing cases which we have quoted at some length, we have obtained data concerning 6 other cases of so-called mixed malarial and typhoid infection, as given in a discussion before the College of Physicians of Philadelphia, February 1, 1899, concerning the experiences in the hospitals of Philadelphia with typhoid fever originating among the soldiers in the late war.

Dr. Arthur C. Meigs reported 2 cases of typhoid fever under treatment at the Pennsylvania Hospital in which there was a return of fever after convalescence seemed to have been fully established. Examination of the blood showed the presence of the plasmodium malarie; the variety was not stated. Recovery followed under quinine.

Dr. Alfred Stengel at the same meeting stated that he had observed 2 cases of typhoid fever in which the malarial parasite had been found during convalescence; the variety was tertian. Recovery followed.

Finally, W. H. Thompson^b reports 2 cases of typhoid fever in which attacks of chills and fever occurred during convalescence and in which microscopic examination of the blood showed the plasmodium malarie; variety not stated. Patient recovered.

^a New York Medical Journal, September 30, 1899.

^b "Acute malarial fever," New York Medical Record, December 10, 1898.

In the following table we have endeavored to arrange, as far as possible, all of the cases cited by us:

Mixed malarial and typhoid infection.

Date.	Author.	Number of cases.	Time of malarial attack.	Variety of parasite.	Termination.
1884	Laveran	1	During convalescence from typhoid.	Tertian	Recovery.
	do	1	Preceding the typhoid and during convalescence.	do	Do.
1890	Kinyoun	1	At commencement of the typhoid.	Not stated	Do.
	do	2	Coincident with the typhoid.	do	Death (peritonitis, pneumonia).
	do	1	During convalescence.	do	Recovery.
	do	1	Doubtful	do	Do.
1894	Thompson (W. G.)	1	Coincident	do	Do.
	do	1	During convalescence	do	Do.
1895	Osler	1	Preceding the typhoid six days	Tertian	Do.
	do	1	Preceding the typhoid thirty days	Æstivo-autumnal	Do.
	Vincent	9	At commencement	Described as amœbic and segmenting forms and crescents.	Do.
	do	7	do	do	Death (myocarditis, nephritis, gangrene of the lung, pneumonia, abscess of the kidney and spleen, peritonitis, etc.).
	do	1	Parasites found at autopsy	do	Recovery.
1897	Da Costa	1	Not stated	Not stated	Do.
1899	Lyon	1	During convalescence	Tertian	Do.
	do	1	Coincident, first week	Æstivo-autumnal	Do.
	Curry	1	On the eighteenth day of convalescence.	Double tertian	Do.
	do	5	During convalescence	Single tertian	Do.
	do	1	do	Double tertian	Do.
	do	2	do	Double tertian; æstivo-autumnal	Do.
	do	3	Two to six months after the typhoid.	Not stated	Do.
	Ewing	1	Immediately preceding	Tertian	Death, fourth week (peritonitis).
	do	2	During convalescence	do	Recovery.
	do	3	do	Not stated	Do.
	Craig	1	Coincident, eighteenth day	Quartan	Death.
	Da Costa	1	Coincident, fifth day	Tertian	Recovery.
	do	1	During convalescence, twenty-eighth day.	do	Do.
1898	do	1	During third relapse, eighty-eighth day.	do	Do.
	do	1	During convalescence, forty-seventh day.	Not stated	Do.
1899	do	6	During convalescence	Tertian or æstivo-autumnal; generally the former.	Do.
	Muehleck	1	Coincident, second week	Variety not determined. Extracorpuscular or intracorpuscular bodies, in some instances containing pigment; bodies spherical, irregular in outline, and in the intracellular variety pigment usually gathered in or near the center.	Do.
	do	1	Coincident, third week	do	Do.
	do	3	During convalescence, fourth week	do	Do.
	do	2	Undetermined	do	Do.
	Withington	1	Coincident	Not stated	Death, twelfth day (perforation).
	do	2	do	Æstivo-autumnal	Recovery.
	do	7	During convalescence	do	Do.
1898	Massachusetts general hospital	1	Coincident	Doubtful	Do.
	do	1	During convalescence	Tertian	Do.
	do	1	do	Æstivo-autumnal	Do.
	do	1	do	do	Do.
	do	1	do	do	Doubtful.
1899	Cleveland Lakeside Hospital	1	do	Double tertian	Recovery.
	do	1	do	Æstivo-autumnal	Death (cause not stated).
	do	1	do	do	Death (amœbic dysentery).
	do	4	do	do	Recovery.
	Grandy	1	Immediately preceding and during convalescence.	Tertian	Do.
	do	1	At commencement	do	Do.
	Meigs	2	During convalescence	Not stated	Do.
	Stengel	2	do	Tertian	Do.
	Thompson (W. H.)	2	do	Not stated	Do.

From this table we are able to make the following distribution of cases according to the time when the malarial parasite was observed in the blood; also the number of deaths.

Distribution of cases according to the time when the malarial parasite was observed in the blood; also number of deaths.

Distribution.	Number of cases.	Number of deaths.
Preceding the typhoid	3	1
Preceding the typhoid and also during the convalescence	2	0
At the commencement of the typhoid	18	7
Coincident with the typhoid	12	4
During convalescence	52	2
Two to six months after typhoid	3	0
Undetermined	4	0
At autopsy	1	1
Total	95	15

Mortality rate, 15.7 per cent.

It is a matter of considerable regret that many of the cases here given are not accompanied by anything like

a complete clinical history or by detailed description of the parasite. In a majority of the cases there is a mere outline of the history. Hence, any attempt at a thorough analysis of these cases is difficult and the result perhaps misleading. We will nevertheless attempt to do so, as far as the material at our disposal will permit.

First. As to the variety of the parasite. In 51 cases this is not stated, nor does the accompanying description enable the type to be defined. Of the remaining 44 cases the variety is recorded as tertian, 22; æstivo-autumnal, 12; quartan, 1; tertian and æstivo-autumnal, 3; tertian and æstivo-autumnal, "generally the former," 6.

Second. As to time of occurrence, there are 5 cases (5.2 per cent) reported as preceding the attack of typhoid fever: Laveran, 1; Osler, 2; Ewing, 1; Grandy, 1.

In two of these cases the parasite was also found during convalescence: Laveran, 1; Grandy, 1.

The interval which preceded the observation of the

malarial parasite and the onset of typhoid fever was as follows: Laveran's case, 15 days; Osler's cases, 6 and 30 days, respectively; Ewing's case, interval stated as "a few days;" Grandy's case, 15 days.

Of the 18 cases (18.9 per cent) in which the parasite is recorded as being present at the commencement of the typhoid fever, 1 case is reported by Kinyoun, 16 by Vincent, and 1 by Grandy.

In Kinyoun's case it is stated that the patient was taken sick two days before admission, the attack commencing with a chill followed by fever, and that the parasites were at this time in the blood in large numbers; six days later rose spots were seen, followed by epistaxis, etc.

In Vincent's cases nothing further is stated than that the microscopic examination of the blood was made during life and at the onset of the disease ("pendant la vie et au début de l'affection").

In Grandy's case a slight chill followed by fever had occurred on the fourth day preceding the examination of the blood, an irregular fever occupying the intervening days. Upon the administration of quinine the temperature dropped, but not quite to normal.

It is worthy of observation that of the 23 cases (24.2 per cent) in which the parasite was observed within a few days preceding the attack, or at the commencement of the typhoid fever, in none of these was its presence recorded during the acute stage of the fever, and in only 2 cases during convalescence. The disappearance of the parasite was probably due in part to the administration of quinine.

In 54 cases (56.8 per cent) the presence of the parasite is recorded as occurring during convalescence from the typhoid fever; and in 2 of these cases it was also seen during the period preceding the attack.

The period during convalescence at which the parasite was found was as follows: First week, 3 cases; second week, 5; third week, 4; fourth week, 2; sixth to twelfth week, 7; undetermined, 33.

In 4 cases (4.2 per cent): Kinyoun, 1; Da Costa, 1; Muehleck, 2. The time of the observation of the presence of the parasite in the blood can not be determined.

In 1 case (1.05 per cent) reported by Vincent the parasites were found at the autopsy.

In 3 cases (3.1 per cent) reported by Curry chronic forms of the æstivo-autumnal parasite were found two to six months after the attack of typhoid fever.

In 12 cases (12.6 per cent) the parasite was found in the blood during the active stage of typhoid fever, and hence these are the only cases that properly belong under the head of coincident malarial and typhoid infection. As regards the previous history of malaria in these concurrent infections, this was positive in 1 case, negative in 3 cases, while 8 patients had been residing in malarial climates at some time shortly preceding the onset of typhoid fever (Cuba, 6; tidewater region, Virginia, 2). The variety of the parasite found in these

12 cases was: Tertian, 1; quartan, 1; æstivo-autumnal, 3; undetermined, 7.

The mortality in these coincident infections was 33½ per cent, or more than double that of the mortality given for all the cases recorded in our table, viz, 15.7 per cent. Excluding the 12 coincident infections, the remaining 83 cases give a mortality of 13.2 per cent.

We think it probable that when a larger number of cases have been reported the mortality rate will be less than here recorded. That it should exceed the average mortality of typhoid fever would not be surprising, since an individual the subject of malarial disease, even if not rendered thereby more susceptible to typhoid infection (of which there is no evidence), would probably be less able to resist the latter when once established.

When it is remembered that these 12 cases of coincident infection are all that we have been able to collect after patient search, and that a stricter criticism of each individual case would have, perhaps, reduced even this number, it will be seen that these concurrent infections are very rare and bear an extremely small proportion to the total number of typhoid cases that have been subjected to microscopic examination of the blood during the past fifteen years.

Therefore, having already conclusively shown in other parts of this report that the fever so prevalent in our military camps during the late Spanish war, and which was diagnosed by the majority of medical officers as malarial remittent or typhomalarial fever, was none other than typhoid fever, it would not be profitable to here further discuss the nature of typhomalarial fever, especially in view of the results obtained by a careful study of all the cases of so-called mixed malarial and typhoid infection recorded in the literature.

It will suffice to state that while the opinion expressed by Woodward, namely, that the poison of malaria and of typhoid fever could be present in the body at the same time, is shown to be well founded, his contention that the two poisons could give rise to a "hybrid form of disease, exhibiting the ordinary symptoms of malarial and typhoid fever variously combined," is not borne out by observation.

Further, that Woodward's opinion concerning the frequency of the association of the two poisons so that "there was danger that this hybrid form would appear in epidemic proportions whenever an army recruited in a nonmalarial region should campaign on malarial soil" is proven to be absolutely without foundation.

Rather do the observations which we have brought together appear to indicate that when an individual the subject of malaria is subsequently infected by the typhoid bacillus, the manifestations of the malarial parasite remain, as a rule, in abeyance during the active stage of the typhoid infection, to reappear in a certain proportion of cases during the stage of debility attendant upon convalescence.

It follows that the term "typhomalarial" as applied

to a particular type of fever, whether used in the sense understood by Woodward or as indicating a severe type of malarial disease, is equally misleading and should be dropped from the nomenclature.

ADDENDUM.

Since the above was written there has been no contribution to the literature of coincident malaria and typhoid fever which does not strengthen the conclusions reached by the board. However, a brief statement of the observations recorded since the publication of the abstract of this report may be of interest.

Rho (*Ann. di Med. Nav.*, 1902) states that the possible coexistence of malaria and typhoid must be admitted, but that there is no fusion of the infecting agents, only a coincidence, and in this the infections show a marked tendency to retain their individuality. As a rule, the typhoid infection is intercurrent with malaria, and during the typhoid course the malarial plasmodium remains quiescent, and again becomes active during convalescence from the typhoid fever. Quinine usually overcomes the malaria. The gravity of the combination depends upon the severity of the separate infections.

Maxwell (*Journal of Tropical Medicine*, 6, 188), in a discussion of typhoid fever among the natives of southern China, states that in the region referred to coincident malaria and typhoid infections are rare, and that he has seen but one case. He concludes that the term "typho-malarial fever" is a misnomer and should not be used, inasmuch as there is no such specific disease.

Krause (*Jour. Am. Med. Ass.*, 41, 86), in an article on "Southern fevers," says that some of the summer-

fall fevers are typhoid, some are malarial, and some are neither, but he does not believe in an X fever. However, he advises that in the treatment of Southern fevers a double infection should be presumed. With the microscope and the agglutination test we can see no reason for such a presumption and must regard it as both unnecessary and unscientific.

Billett (*Rev. de Méd.*, 1902) has observed 47 cases of malaria in which the symptoms closely resembled those of typhoid fever, but microscopical examination of the blood rendered the diagnosis positive.

Fiocca (*Il Policlinico*, 1901) reports the following case: The patient, who had previously been well, paid a visit to Leprignano on October 4, when, on the 15th of the same month he was attacked with malarial fever and admitted to the hospital. He was discharged October 30, but readmitted November 25; this time with typhoid fever. He remained in hospital until December 28, during which time his serum agglutinated the typhoid bacillus, while microscopical tests showed the absence of the plasmodium. After the last-mentioned date there was an afebrile period of six days; then an attack of malaria, with the estivo-autumnal parasite, which speedily disappeared on the administration of quinine. On January 10 there was a relapse of the typhoid fever, which continued until January 22, after which there was another afebrile period of nine days, and this was followed January 31 with another attack of malaria, which again yielded to quinine and after which the patient remained in good health. Here, then, was a coincident infection with the disappearance of the malarial parasite in both the primary typhoid and during the relapse.

CHAPTER XIV.

GENERAL STATEMENTS AND CONCLUSIONS.

(1) *During the Spanish war of 1898 every regiment constituting the First, Second, Third, Fourth, Fifth, and Seventh Army Corps developed typhoid fever.*

This is true of both the volunteer and the regular commands. We are aware of the fact that several regiments have claimed freedom from typhoid fever, and it is true that the sick records of more than one command failed to show any evidence of this disease; but by carefully tracing the sick to hospitals we have been able to find one or more cases of typhoid fever in every regiment.

(2) *More than 90 per cent of the volunteer regiments developed typhoid fever within eight weeks after going into camp.*

The following table gives for 106 regiments, in which these data were ascertained, the time of assembly at the State encampment, the date of muster into the United States service, the date of arrival at national encampments, and the date of appearance of the first case of "probable" and of "recognized" typhoid fever:

Regiments.	Assembled at State encampment.	Mustered into United States service.	Arrived at national encampment.	Date of first case of probable typhoid.	Date of first case of recognized typhoid.	For history see page—
FIRST ARMY CORPS.						
FIRST DIVISION.						
First Kentucky	Last May	June 5	June 11	June 19	June 20	1
Third Wisconsin	Last April	May 8	May 15	May 24	May 28	9
Fifth Illinois	April 26	May 7	May 17	May 16	May 16	17
Fourth Ohio	In April	May 9	May 16	May 17	July 16	21
Third Illinois	do	May 7	May 17	do	June 28	23
Fourth Pennsylvania	do	May 10	May 16	June 1	June 1	27
Sixteenth Pennsylvania	do	May 11	May 17	May 8	May 20	28
Second Wisconsin	April 28	May 12	do	May 11	June 16	32
Third Kentucky	In May	May 21	June 2	June 9	June 21	38
SECOND DIVISION.						
Thirty-first Michigan	In April	May 6	May 17	June 1	June 1	45
One hundred and sixtieth Indiana	do	May 8 ^a	do	July 4	July 7	51
First Georgia	In May	In May	June 17	June 6	June 6	57
One hundred and fifty-eighth Indiana	In April	May 12	May 16	do	June 24	62
Sixth Ohio	April 25	do	May 18	May 18	May 18	65
First West Virginia	In April	May 10	May 20	June 6	June 16	74
First Pennsylvania	April 28	May 11	May 18	May 12	May 12	88
Fourteenth Minnesota	In April	May 10	do	May 27	June 3	94
Second Ohio	do	do	do	May 20	June 22	96
THIRD DIVISION.						
Fifth Pennsylvania	April 27	May 11	May 20	May 19	May 19	109
Twelfth Minnesota	April 29	May 7	do	May 20	May 21	113
Eighth Massachusetts	May 5	May 8	do	May 28	July 24	123
Twenty-first Kansas	In April	May 10	do	May 21	May 21	128
Twelfth New York	May 2	do	do	June 6	July 3	134
Second Missouri	do	do	do	May 26	May 27	145
First New Hampshire	In April	May 12	May 22	May 24	June 4	149
Ninth Pennsylvania	do	May 10	May 20	May 31	June 14	154
THIRD ARMY CORPS.						
FIRST DIVISION.						
Fourteenth New York	In April	May 13	May 20	May 23	June 12	161
First Missouri	do	do	May 21	May 31	June 28	163
Fifth Maryland	do	May 10	do	June 25	June 25	168
Second Nebraska	April 27	do	May 22	May 26	June 3	174
Second New York	In April	May 8	May 21	June 1	June 1	178
Third Tennessee	do	May 5	May 24	June 9	June 26	182
First Vermont	April 1	May 16	do	May 26	do	186
Eighth New York	In April	May 21	May 25	June 24	June 24	191
SECOND DIVISION.						
Second Kentucky	In April	May 22	May 26	June 26	June 26	209
Ninth New York	May 2	May 10	do	June 10	June 13	215
First Arkansas	In April	May 19	May 27	June 2	June 3	220
Fifth Missouri	do	May 18	do	June 6	July 2	229
Second Arkansas	In May	May 27	May 30	June 4	June 15	233
Sixty-ninth New York	In April	May 6	May 27	June 12	June 23	240
First Maine	do	May 13	May 30	June 25	June 27	247
Fifty-second Iowa	April 26	May 25	May 31	June 8	June 8	250
First Mississippi	In May	May 26	do	June 1	June 1	257

^a About.

Regiments.	Assembled at State encampment.	Mustered into United States service.	Arrived at national encampment.	Date of first case of probable typhoid.	Date of first case of recognized typhoid.	For history see page—
SECOND ARMY CORPS.						
FIRST DIVISION.						
(Camp Alger, Va.)						
Sixty-fifth New York	May 2.	May 17.	May 20.	May 18.	May 18.	312
Seventh Ohio	End April	May 11.	May 21.	May 14.	May 14.	315
First New Jersey	do	May 5.	do	July 2.	July 2.	318
Sixth Illinois	do	May 11.	do	May 15.	May 15.	320
Sixth Massachusetts	do	May 12.	May 22.	June 2.	June 2.	321
Eighth Ohio	do	May 13.	May 19.	July 12.	July 12.	323
Eighth Pennsylvania	do	May 11.	May 18.	May 15.	May 15.	324
Twelfth Pennsylvania	do	do	May 19.	June 26.	June 26.	327
Thirteenth Pennsylvania	do	May 12.	do	June 16.	June 16.	331
Third Virginia	do	May 13.	June 5.	June 6.	June 6.	334
First Connecticut	May	May 17.	July 19.	August 5.	August 5.	336
A and C, New York Cavalry	do	May 20.	May 23.	May 30.	May 30.	338
SECOND DIVISION.						
(Camp Alger, Va.)						
Twenty-second Kansas	End April	May 11.	May 28.	July 27.	June 21.	343
One hundred and fifty-ninth Indiana	do	May 12.	May 24.	June 14.	June 14.	345
Third New York	May	May 17.	May 29.	June 18.	June 18.	347
Seventh Illinois	do	May 18.	June 3.	July 10.	July 10.	349
Sixth Pennsylvania	End April	May 10.	May 19.	May 29.	May 29.	350
Fourth Missouri	May	May 16.	May 27.	June 12.	June 12.	352
Ninth Ohio Battalion	do	May 14.	May 20.	July 19.	July 19.	355
Third Missouri	do	do	May 30.	June 30.	June 20.	357
First Rhode Island	End April	May 10.	May 28.	July 12.	July 12.	358
Second Tennessee	do	May 7.	May 29.	May 29.	May 29.	362
FIRST DIVISION.						
(Camp Meade, Pa.)						
First Maryland	April 25	May 16.	May 25.	August 2.	July 30.	382
Thirty-fifth Michigan	July 10	July 9	September 16	do	July 28.	388
Tenth Ohio	July 5.	July 1.	August 19	July 16.	July 16.	396
Third Connecticut	June 23.	July 2	September 10	August 14.	August 22.	402
Two hundred and second New York	July 29	July 19	September 14	August 30.	August 28.	408
Fifteenth Minnesota	July 5.	July 9	September 18	August 3.	July 20.	414
SECOND DIVISION.						
(Camp Meade, Pa.)						
Fourth New Jersey	July 19.	July 7.	October 9.	August 2.	September 7.	434
Second West Virginia	June 23.	June 25.	August 30.	July 10.	July 5.	439
Two hundred and third New York	July 10.	July 15.	September 12	July 27.	August 4.	444
Fifth Massachusetts	June 10.	June 30	September 12	August 2.	August 2.	466
Two hundred and first New York	July 4.	July 16.	September 9	August 20.	August 4.	460
First Delaware	April 26.	May 9.	August 20	May 21.	July 27.	466
Second Pennsylvania	April	May 10.	May 19.	May 26.	August 2.	470
FOURTH ARMY CORPS.						
First Ohio	End April	May 6.	May 16.	June 1.	July 22.	484
One hundred and fifty-seventh Indiana	do	May 10.	May 17.	June 10.	June 18.	491
Thirty-second Michigan	do	May 11.	May 22.	July 5.	July 5.	492
Second Georgia	do	do	May 21.	May 20.	June 8.	494
Fifth Ohio	do	do	do	May 21.	May 21.	497
SEVENTH ARMY CORPS.						
FIRST DIVISION.						
First Alabama	End April	May 9.	June 21.	May	May	520
First South Carolina	May	May 10.	June 7.	May	do	621
Second Alabama	May	May 15.	June 30.	June	June	523
First Louisiana	End April	May 8.	June 23.	June 15.	June 15.	525
Second Louisiana	do	May 11.	June 29.	May	May	526
First Texas	do	May 10.	do	June	June	527
Second Texas	do	May 11.	June 28.	do	do	529
SECOND DIVISION.						
Second New Jersey	April 27	May 13.	June 3.	June 29.	July 3.	531
Second Illinois	April 26	May 16.	May 23.	May 25.	May 29.	539
First North Carolina	May 1.	May 3.	do	June 6.	June 27.	551
Fiftieth Iowa	April 26.	May 17.	May 25.	June 20.	June 16.	559
Ninth Illinois	June 27	July 4.	August 8.	July 21.	July 6.	567
First Wisconsin	April 28	May 14.	May 24.	June 21.	May 14.	573
Second Virginia	May 10.	May 11.	June 3.	June 2.	June 8.	586
Fourth Virginia	May 9.	May 9.	June 7.	June 11.	do	592
Forty-ninth Iowa	April 26.	June 2.	June 14.	June 14.	July 22.	599
THIRD DIVISION.						
Second Mississippi	May	May 20.	June 21.	June 8.	June 8.	611
Fourth Illinois	do	May 19.	May 29.	July 11.	July 11.	616
Second U. S. Volunteer Cavalry	April	May 1.	June 28	July 30.	July 30.	624
Third Nebraska	do	July 1.	July 22.	July 26.	July 26.	627
One hundred and sixty-first Indiana	June	July 11.	August 14.	July 16.	July 16.	631
Sixth Missouri	June	July 30.	August 15.	August 1.	August 1.	633
Second South Carolina	May	May 14.	September 16	June 20.	June 20.	636

The foregoing table may be briefly summarized as follows:

	Number of regiments which came to national encamp- ments with typhoid fever.	Number of regiments which developed typhoid fever after arrival at national encampments in—			
		Two weeks.	Three weeks.	Four weeks.	Over four weeks.
Number of regiments with recognized cases of typhoid fever.....	35	18	13	8	32
Number of regiments with "recognized or probable" cases of typhoid fever.....	41	30	15	5	15

It will be seen that we have obtained the initial dates of the first cases of "probable" and of "recognized" typhoid fever in 106 regiments. If we suppose that the cases of recognized typhoid fever were actually the first cases of the disease, then the following statements are correct:

(a) Thirty-five regiments, or 33.01 per cent, reached the national encampments with developed cases of recognized typhoid fever.

(b) Eighteen regiments developed recognized typhoid fever within 14 days after arriving at national encampments, thus making 53 regiments, or 50 per cent, with recognized typhoid fever within 14 days after reaching national encampments.

(c) Thirteen additional regiments developed recognized typhoid fever within 21 days after reaching national encampments. Thus, 3 weeks after arriving at the national encampments 66, or 62.26 per cent, out of the 106 regiments, had cases of recognized typhoid fever.

(d) Eight additional regiments developed recognized typhoid fever within 28 days after reaching national encampments, thus making the total number of regiments with recognized typhoid fever 28 days after arrival 74, or 69.81 per cent.

If our claim be accepted that the cases designated as probable typhoid fever were really due to this disease, the following conclusions may be drawn:

(a) Forty-one, or 38.67 per cent, reached the national encampments with cases of typhoid fever already developed:

First Army Corps, Chickamauga Park.

Fifth Illinois.	First Pennsylvania.
Third Illinois.	Fifth Pennsylvania.
Sixteenth Pennsylvania.	Twelfth Minnesota.
Second Wisconsin.	First Georgia.
Sixth Ohio	

Second Army Corps, Camp Alger, Va.

Sixty-fifth New York.	Second Tennessee.
Seventh Ohio.	Eighth Pennsylvania.
Sixth Illinois.	

Second Army Corps, Camp Meade, Pa.

Thirty-fifth Michigan.	Second West Virginia.
Tenth Ohio.	Fifth Massachusetts.
Third Connecticut.	Two hundred and first New
Two hundred and second New	York.
York.	First Delaware.
Fifteenth Minnesota.	Fourth New Jersey.
Two hundred and third New	
York.	

Fourth Army Corps, Mobile, Ala., etc.

Second Georgia.	Fifth Ohio.
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Seventh Army Corps, Jacksonville, Fla.

Ninth Illinois.	Second Texas.
Second Virginia.	First South Carolina.
Forty-ninth Iowa.	One hundred and sixty-first
First Alabama.	Indiana.
Second Alabama.	Second Mississippi.
First Louisiana.	Sixth Missouri.
Second Louisiana.	Second South Carolina.
First Texas.	

(b) Thirty additional regiments developed typhoid fever within 14 days after reaching the national encampments. In other words, 71, or 66.98 per cent, of the 106 regiments had developed typhoid fever within 14 days after reaching the national encampments.

(c) Eighty-six, or 82.26 per cent, of the 106 regiments had developed typhoid fever within 3 weeks after arriving at the national encampments.

(d) Five additional regiments developed typhoid fever within 28 days after reaching national encampments, thus making the total number of regiments with typhoid fever 28 days after arrival 91, or 85.84 per cent.

(e) Thirteen additional regiments developed typhoid fever within 8 weeks (viz, 5 in 5 weeks, 3 in 6 weeks, 4 in 7 weeks, and 1 in 8 weeks) after reaching the national encampments, thus making the total number of regiments with typhoid 8 weeks after arrival 104, or 98.11 per cent.

Of the remaining 2 regiments, 1, the Ninth Ohio Battalion, developed typhoid fever in 9 weeks, and 1, the First Maryland, in 10 weeks after arrival at national encampments.

We have been compelled to satisfy ourselves with a general statement that many of the regiments assembled at State encampments in April. In fact, this general statement must suffice, because no one day can be given as the day of assembly. Some companies reached the State encampment a few days earlier or later than others. However, as the first call for troops was issued April 20, 1898, it must follow that all regiments which assembled at State encampments in the month of April did so during the last week of that month. Bearing this in mind, and accepting our cases of probable typhoid as the first cases of this disease, it will be seen by an inspection of the table given that of the 106 regiments for which we have the data bearing upon this subject 97, or 91.52 per cent, developed typhoid fever within 8 weeks after assembling at the State encampment.

(3) *Typhoid fever developed also in certain of the regular regiments within three (3) to five (5) weeks after going into camp.*

When war with Spain was proclaimed the total strength of the standing Army of the United States numbered 27,000 officers and men. They were scattered at about 100 military garrisons. All these soldiers were well housed and their quarters were, from a sanitary standpoint, in good condition. At most of the garrisons, at least, the water supply was above suspicion, and the disposal of waste was such as not to endanger the health or life of the soldier. There was no epidemic at any post, and the army was reasonably free from infectious disease, except those of venereal origin. The number of cases of typhoid fever among the 27,000 officers and men during the first four months of 1898 was distributed as follows: In January, 9 cases, with 1 death; in February, 3 cases, with 1 death; in March, 4 cases, with no deaths; in April, 6 cases, with 1 death. During the last week in April and the first week of May, 1898, the regular regiments were assembled at national encampments and placed under canvas. These regiments were receiving recruits in considerable numbers from the larger centers of population.

The following table shows the dates of going into encampment and the appearance of first cases of recognized typhoid fever in those regular regiments for which we have been able to obtain desired data:

Command.	Date of going into encampment.	Date of first case of recognized typhoid fever.
Second U. S. Infantry	Apr. 22, 1898	May 28, 1898
Fourth U. S. Infantry .....	.....do.....	May 18, 1898
Sixth U. S. Infantry .....	.....do.....	May 19, 1898
Seventh U. S. Infantry	Apr. 24, 1898	May 26, 1898
Thirteenth U. S. Infantry	Apr. 23, 1898	May 8, 1898
Sixteenth U. S. Infantry	Apr. 22, 1898	May 20, 1898
Twenty-second U. S. Infantry .....	.....do.....	May 29, 1898
Twenty-fourth U. S. Infantry (colored)	Apr. 20, 1898	May 28, 1898
Twenty-fifth U. S. Infantry (colored) .....	.....do.....	.....do.....

(4) *Typhoid fever became epidemic both in the small encampments of not more than one regiment and in the larger ones consisting of one or more corps.*

The statement has been made that the epidemics of typhoid fever in our national encampments in 1898 were due to crowding together large numbers of men. We have seen that the Third North Carolina, at its isolated post at Fort Macon, N. C., developed typhoid fever before it was sent to Knoxville, where it became a part of the Second Division of the First Army Corps.

When we reached Knoxville, Tenn., in our round of inspecting the troops, we were informed that the Fourth Tennessee was encamped near Knoxville, where it had been since mobilization, and that it was wholly free from typhoid fever. A personal investigation showed the following facts: This regiment assembled at the camp near Knoxville, Tenn., June 28, 1898, although it was not mustered into the United States service until about the middle of July. On August 12 Ernest Martin, who had not been well for a week preceding this time, was admitted to the regimental hospital. On August 15 he was furloughed home, and on September 11 he died at his home in Nashville, Tenn., of typhoid fever. From the date of this first case up to the time of our inspection (September 14, 1898) there had been in this regiment not less than 11 well-marked cases of typhoid fever, although none had been so diagnosed by the regimental surgeon.

The Fifteenth Minnesota (p. 414), at its regimental encampment on the fair grounds at St. Paul, Minn., and the Thirty-fifth Michigan (p. 388), at Island Lake, Michigan, developed epidemics of typhoid fever. Other instances might be cited, but these suffice to show the truth of the statement that the disease became epidemic in small as well as in large encampments.

(5) *Typhoid fever became epidemic in camps located in the Northern as well as in those located in the Southern States.*

Some army medical officers have placed stress upon the fact that Northern men were transferred to Southern States, and have attributed considerable importance to the influence of nonacclimatization in the production of the epidemics of typhoid fever. In answer to this we need only call attention to the fact that the Fifteenth Minnesota (p. 414), Thirty-fifth Michigan (p. 388), and the Two hundred and third New York (p. 444) surpassed any other three regiments in the number of cases of typhoid fever before they crossed the Mason and Dixon line. There is nothing more certain than that the prevalence of typhoid fever among the troops in 1898 was not due to geographical location.

(6) *Typhoid fever is so widely distributed in this country that one or more cases are likely to appear in any regiment within eight weeks after assembly.*

We have no reliable data concerning the extent to which typhoid fever prevails in this country, but from the number of deaths from this disease we can fairly estimate the number of cases. The following figures may give us some idea as to the chances of infected men being found in each volunteer regiment. In making this calculation we will figure on the number of cases of typhoid fever in New York City. This place is selected because it is not subject to epidemics of typhoid fever and, in fact, is believed to be unusually free from that disease. In 1897 there were 299 deaths from typhoid fever reported in New York City. Supposing that typhoid fever is no more deadly in New York City than it is in Hamburg—and there is no reason for believing that it is—then 299 (the number of deaths from typhoid fever) is about 7.5 per cent of the total number of cases of typhoid fever that occurred in New York City in the year given. On making this computation we find that there were in New York City in 1897, 3,853 cases of typhoid fever. It is safe to say that at least four-fifths of the cases of typhoid fever occur in individuals of the military age (between 18 and 45 years). This means that in 1897 there were in New York City 3,082 cases of typhoid fever among those inhabitants who were from 18 to 45 years of age. The Government census for 1890 places the population of New York City at that time at 1,515,301. A police census made in April, 1895, indicated a population of 1,849,866. We will be liberal in our calculations and suppose that the population of New York City in 1897 was 2,000,000. In round numbers the number of people between 18 and 45 years of age is one-half the total population. On this basis the number of people of military age in New York City in 1897 may be placed at 1,000,000 (this of course includes both males and females). Had this 1,000,000 of people of military age been divided into regiments of 1,300 each they would have furnished 769 commands. We have seen that the number of cases of typhoid fever in New York City in 1897 among people of military age was 3,082, and if these had been evenly divided among the regiments of 1,300, each command would have contained at least 4 persons who would develop typhoid fever during the year. We make no claim that the above-given figures are accurate. We have presented them simply for the purpose of showing the chances of there being men infected with typhoid fever in every regiment of volunteers. We think that it must be admitted that there is not much difficulty in accounting for the origin of typhoid fever in our national encampments. With this disease as prevalent as it is throughout the country, it is more than probable that in any organization of 1,300 men of military age taken from private life and held together for two months one or more cases will develop.

(7) *Typhoid fever usually appears in military expeditions within eight weeks after assembly.*

In the history of the war of the rebellion there is but little information concerning the importation of typhoid

fever, more attention being given to general reports concerning hard service, inclemency of the weather, and insanitary conditions in camp as connected with the prevalence of this disease. More importance is attached to exposures, hardships, the unaccustomed mode of life of the young soldiers, overcrowding, and bad ventilation than to importation of the disease from the localities where the men were recruited, although this is occasionally suggested. The absence of special reports on the causation of typhoid fever in the camps was attributed to the difficulties attending an investigation into the origin and transmission of this disease, owing to the existence of unknown and unsuspected factors.

When the Franco-German war began every corps of the German army was infected with typhoid fever, and the Second Division of the Eleventh Corps was having at that time a marked epidemic of this disease. The following figures show the number of cases of typhoid fever in each corps of the Prussian army on June 15, 1870:

	Num- ber of cases.	Rate per thou- sand.		Num- ber of cases.	Rate per thou- sand.
General Corps.....	23	1.3	Sixth Corps.....	29	2.1
First Corps.....	18	1.3	Seventh Corps.....	17	1.2
Second Corps.....	7	.51	Eighth Corps.....	16	.93
Third Corps.....	10	.68	Ninth Corps.....	10	.67
Fourth Corps.....	6	.42	Tenth Corps.....	22	1.6
Fifth Corps.....	9	.68	Eleventh Corps.....	41	3.0

The infection was not confined to the Prussians, but extended to every contingent of the German army. The seeds of the disease carried with them rapidly bore fruit, especially among the troops besieging Metz and later among those besieging Paris. Within less than two months after war was proclaimed typhoid fever had extended so widely among certain divisions of the German troops, notably in the Eleventh Corps of the Prussian army and in the Wurtemberg division, that more than 15 per cent of the men of these commands were sick with this disease. The total number of cases among the underofficers and men in the German army during the Franco-German war amounted to 73,396, which is equivalent to 9.31 per cent of the average strength of the army. It will be remembered that the invasion of France began about the middle of July, 1870. During the second half of this month the total number of cases in the German army was 345, less than the average for preceding years of peace. In August the number perceptibly increased, amounting to 2.6 per thousand, but this was not sufficient to cause any alarm, and up to the beginning of September it could not be said that there was an unusual prevalence of this disease. However, early in this month there was an explosive outbreak, and the cases ran up to 12,463, which was equivalent to 15.3 per thousand. October showed 17,253 new cases. In this month the epidemic reached its climax, fell slowly until January, 1871, and more rapidly to June, but at the last-

mentioned date it had not reached the peace level. During the fall of 1870 there was not a regiment in the German army free from typhoid fever. In addition to the importation of typhoid fever, the Germans invaded a country in which this disease was then and is at all times practically endemic. However, the point which we wish to emphasize here is that the invading army transported typhoid fever with it and that from seeds thus carried the disease spread until no regiment remained free from it.

Typhoid fever may be transported along with an army into regions where man has never previously been. This was illustrated in the Afghan war, from 1878 to 1880. Several of the encampments of the English soldiers during this invasion of Afghanistan occupied positions probably never before occupied by human beings. It is not at all likely that the water, which was obtained from mountain streams in the invaded region, was specifically contaminated with the virus of typhoid fever; nor was it likely that the virgin soil covered by these encampments was infected, except as it became so by occupation, and yet typhoid fever occurred at nearly every station occupied by the English troops. Only one explanation of the prevalence of this disease in these places seems possible. It is known that the English troops which had been encamped in various parts of India were widely infected with typhoid fever when the invasion of Afghanistan was begun. A similar experience is furnished by the history of French expeditions in Northern Africa. In the Oran campaign in 1885 French commands encamped in desert stations never before occupied, and in these typhoid fever not only appeared, but acquired epidemic proportions.

In the Suakin expedition of 1885 every precaution was taken to insure a pure water supply for the troops. In fact, all the drinking water was distilled. Notwithstanding this fact typhoid fever prevailed quite extensively. At least one regiment, the East Surrey, joined the expedition already infected with typhoid fever. It is more than likely that these men infected the latrines and that flies aided in the distribution of the disease.

In the expedition for the relief of Chitral, from March 28 to August 24, 1895, typhoid fever was carried along with the English soldiers. The first recognized case of this disease occurred April 29, although this had been preceded by several other cases the diagnosis of which had been doubtful at the time and which had been transferred to base hospitals, proving later to be typhoid fever. The expedition consisted of two regiments, with a total strength of 1,601 officers and men. After battles at Malakand and Kahr, April 3 and 4, these regiments were encamped at Kahr, in the Swat Valley, 2,000 feet above sea level. The health was good at first, but with the increasing heat the men, who were very much crowded together in small single fly tents, began to suffer from malarial fever, and typhoid fever soon made its appearance. From April 29 to

August 4, the time of the arrival of the expedition at Laram Kotal, 172 cases, with 39 deaths, were reported. In regard to this epidemic, Surgeon Major-General Mansell makes the following statement:

The first case * * * on April 29 was probably imported from India. Once the disease was introduced into such camps as the troops occupied first at Kahr, and later on at Laram Kotal, and bearing in mind the predisposing influences of climate and other conditions of the former place in May, when the men were inactive, the hard work they subsequently underwent road making, the gradual fouling of the soil through the extension of latrine trenches, the inadequate conservancy arrangements due to the want of a sufficient establishment, it is not difficult to account for the rapid spread of the disease. The milk and bazaar supplies were, of course, liable to suspicion, but both were under strict supervision, and the outbreak can not, in my opinion, be attributed to them. The water supply, which was bad at Kahr, may also be disregarded as the cause, as when the troops moved to Laram, where the supply was excellent, the epidemic increased in virulence. I attribute the disease to the fouling of the ground, inevitable in camps, the lack of sufficient conservancy establishments, the contamination of food, etc., through the agency of dust and flies, and the necessary crowding, dirt, and intimate contact in which the men lived, often I think carrying the infective germ from one to another. The absence of these last conditions goes far to explain the remarkable immunity from the disease that the officers enjoyed.

When the English invaded Egypt in 1882, some of the regiments which had been withdrawn from Mediterranean stations, and which constituted a part of the army of invasion, were infected with typhoid fever before leaving their stations. Soon after disembarking at Ismailia occasional cases of typhoid fever began to appear. The disease was at first diagnosed remittent fever, but as it did not yield to quinine in full doses, two autopsies were held, and these showed the lesions of typhoid fever. From Ismailia the disease accompanied the troops until the army took up its permanent camp at Cairo, at which place it culminated in a serious epidemic. The camp sites of the several regiments were situated on sandy soil and were some distance apart, and the latrines were easily dug and regularly filled up; frequent inspection failed to show any sanitary defect. All excreta from fever patients, as well as bedding and clothing used by them, were at once disinfected. The excreta were deposited in a special pit; all the water was boiled and filtered. Notwithstanding this, many of the hospital corps men contracted the disease in removing the excreta of patients. On the March from Ismailia to Cairo the troops drank canal water; but that this water did not occasion the epidemic appears to be borne out by the immunity from typhoid fever enjoyed by the Indian contingent and the Seaforth Highlanders, although using the same water. The Manchester regiment also, which garrisoned Ismailia—the termination of the canal—and used this water, had only one case. The Household Cavalry and the Fourth Dragoon Guards, which were in the desert during the whole of the campaign, having hard work, suffering much exposure, drinking bad water, and living in insanitary camps, suffered comparatively little.

The Seventh Dragoons and the Nineteenth Hussars remained long in camp at Cairo and suffered greatly, the disease being most prevalent among them during the months of November and December.

According to Surgeon-Major Tarrant, the epidemic of typhoid fever which prevailed among the English and native troops in the Zulu war (1878-79) was imported into Fort Pearson from Thring's Post and Saccharine. In regard to the same epidemic, Major Hodgson states:

Numbers of men came from Fort Chelmsford with remittent and simple continued fever, of which a large portion proved to be enteric. In a general way, though a large proportion of the fevers were returned as simple continued, my impression is that nearly all of the cases were enteric of the milder or more severe type. From such inquiries as I was able to institute, I concluded that enteric fever was originally brought from Durban and was carried by the troops to the various stations where it broke out, and that in all cases it was aggravated by the gathering together of a large number of men and cattle, and the insanitary state which always accompanies such conditions.

The history of mining expeditions also gives us instances of the transportation of typhoid fever to places far remote from the permanent habitations of man, as is illustrated by the epidemic at Dawson City, on the Yukon, in January, 1899. Indeed, the history of this disease justifies us in stating that wherever and whenever men congregate and live without adequate provision for disposing of their excrement, there and then typhoid fever will appear.

(8) *The miasmatic theory of the origin of typhoid fever is not supported by our investigations.*

There are still a few who believe that typhoid fever is due to a poison or miasm given off from the earth in gaseous form. We would not mention this obsolete theory were it not for the fact that while inspecting the camps we found intelligent medical officers who believed that some intangible local condition inherent in the place was an important factor in the production of the epidemic. There is apparent in man a tendency to believe in the evil genius of locality. He is prone to attribute many of his misfortunes to indefinable conditions surrounding the place in which he has suffered. As we have stated, no fact in our investigations has been brought out more prominently than the demonstration that locality was not responsible for the epidemic. The Fifteenth Minnesota (p. 414) first developed typhoid fever at the fair grounds at St. Paul. There is certainly no evidence that there is any evil climatic influence connected with this place. It carried the epidemic with it to Fort Snelling, which has long had the reputation of being one of the most healthful army posts in the United States. From Fort Snelling the Fifteenth Minnesota was transferred to the open fields of Camp Meade, where generations of Pennsylvania farmers have passed the average number of years allotted to man without suspecting that their country was an unhealthy one. However, typhoid fever con-

tinued with the command from Minnesota because the men carried the germs of the disease in their bodies, clothing, bedding, and tentage. Certainly any rational being would prefer any of the above-mentioned localities to Port Tampa as a place of summer residence, and yet there was not a regiment in the Fourth Army Corps, encamped for so long a time in Florida, that had as many cases of typhoid fever as did the Fifteenth Minnesota.

(9) *The pythogenic theory of the origin of typhoid fever is not supported by our investigations.*

Murchison proposed this theory of the origin of typhoid fever. This author states the theory in the following words:

Typhoid fever may be generated independently of a previous case by fermentation of fecal, and perhaps other forms of organic matter.

Translated into the terms of modern medicine, this theory is founded upon the belief that the colon germ may undergo a ripening process by means of which its virulence is so increased and altered that it may be converted into the typhoid bacillus, or at least may become the active agent in the causation of typhoid fever. Many French, English, and American army medical officers believe that typhoid fever may originate in this way. Rodet and Roux, of the French army, have stated their belief that outside of the body the colon bacillus acquires "typhogenic" properties. Surgeon-Captain Davies, assistant professor of hygiene in the English Army Medical School, has expressed his belief in this theory. Some of the medical officers in the American Army have also given it their adherence. Surgeon Davies gives the following statement of the reasons for his belief in this theory:

It is well known that "camp diarrhea" is of the commonest occurrence among troops shortly after taking the field in a tropical or subtropical climate. Change of habits, change of food, improper or unsuitable food, bad water, heat, and exposure to sun and chill—these are all obvious factors in its causation; there is nothing in any way specific. Let us consider the sequel as regards the individual and as regards his surroundings. The individual may in some cases remain in fairly good health and vigor in spite of a continuance of the bowel trouble; other individuals may suffer more from the exposure, fatigue, and weakening effects of the continued flux. The surroundings may possibly be and remain sanitary, the camp clean, the water pure; but in all probability the reverse will be the case—at any rate, in some instances—the water bad, the soil fouled, very likely overcrowding of the camp, with consequent difficulty, if not impossibility, of proper removal or disposal of fecal matters. Under certain conditions of heat and moisture favorable to the development and multiplication of low forms of vegetable and animal life which is the more likely or reasonable to expect, that diarrhea in weakly and exhausted individuals should remain diarrhea and nothing more, or that with an increase of filth and decomposition, polluting soil, air, and water, a development of filth-generated pythogenic poison should take place, capable of causing in such weakly persons a fever, with diarrhea, a poisoning of the organism, producing pyrexia and inflammation of certain glands in the alimentary tract—in fact, a specific fever? Is this supposition of the evolution, gradual or rapid according to circumstances, of a disease poison dependent on

increasing conditions of pollution of soil, air, or water, either separately or all three together, unreasonable or illogical? Would it not, on the contrary, be more unreasonable to suppose that, under such conditions, there should be no evolution at all? These conditions of camp pollution undoubtedly exist and tend to increase in many instances. Are they to have no effect? Is diarrhea to continue as simple diarrhea, or is evolution to come into action and produce a new disease? Now, indeed, only because the causes necessary for its production are just now brought into action—spontaneously only in the sense that water is of spontaneous origin, when from hydrogen and oxygen the electric spark has produced water where no water was before.

We believe that the results of our investigations controvert this theory conclusively. In the first place, we have been able to show that the specific poison of typhoid fever was introduced into every one of our national encampments, and with the disease as widespread as it is in this country we believe that we have good reasons for the claim that one or more men already specifically infected with typhoid fever enlisted in nearly every command. There is, therefore, no necessity of resorting to the theory that the colon bacillus may be converted into the typhoid bacillus. Moreover, all the known facts of experimental bacteriology are at variance with this theory. The supposition that simple diarrheas may develop into typhoid fever will be again referred to. The fact that the typical colon bacillus may be swallowed by thousands of people in drinking water without the occurrence of a case of typhoid is plainly demonstrated in Appendix I.

(10) Our investigations confirm the doctrine of the specific origin of typhoid fever.

As has already been stated, we have been able to trace the introduction of typhoid fever into every one of our national encampments and into the majority of the regiments. In case of the few commands about which there is some uncertainty as to the men bringing the typhoid infection from their homes, we may state that in all of these there was ample opportunity for the introduction of the specific poison from other commands.

(11) With typhoid fever as widely disseminated as it is in this country, the chances are that if a regiment of 1,300 men should be assembled in any section and kept in a camp the sanitary conditions of which were perfect, one or more cases of typhoid fever would develop.

We have already stated our reasons for our belief in the above-given proposition. In such a camp, however, the disease would not become epidemic, and ultimately it should disappear altogether. The camps of the Second Pennsylvania (p. 470) were exceptionally well located and policed, and yet a few cases of typhoid developed in this regiment.

(12) Typhoid fever is disseminated by the transference of the excretions of an infected individual to the alimentary canals of others.

This statement is so self-evident that it needs no elucidation. The transference may be direct by con-

tact or indirect through infected garments, bedding, tentage, food, water, etc.

(13) Typhoid fever is more likely to become epidemic in camps than in civil life because of the greater difficulty of disposing of the excretions from the human body.

This proposition is so self-evident that it needs no lengthy argument to support it. The influence of the introduction of sewers into cities in decreasing sickness from this disease is well known to every student of sanitary science. Moreover, since the disease is disseminated by the transference of the excretions of an infected individual to the alimentary canal of others, it must follow that the more thoroughly and completely the excretions are removed from the vicinity of habitations the less will be the danger of infecting the inhabitants. In fact, the whole question of the prevention of typhoid fever in armies is largely one of the disposition of the excretions. Later we will give figures to show that the prevalence of typhoid fever in certain camps was in an inverse proportion to the thoroughness with which the excretions were removed from the vicinity of the camps.

(14) A man infected with typhoid fever may scatter the infection in every latrine in a regiment before the disease is recognized in himself.

The elimination of typhoid bacilli from the bowels probably begins soon after infection. If this be true, during the entire period of incubation an individual may be a source of danger to others. Moreover, in most instances of typhoid fever the disease is not recognized during the prodromal stage, and during this time the excretions may be laden with typhoid bacilli. It must be evident from this that the only way in which typhoid epidemics can be with certainty prevented in armies is by the complete disinfection of the excreta of all, both the sick and the well. The importance of the disinfection of the urine in this disease is emphasized in Appendix III.

(15) Camp pollution was the greatest sin committed by the troops in 1898.

In our histories of the different regiments we have had too frequent opportunity to call attention to the fearful pollution that existed in many camps. As we have stated, fecal matter was deposited on the surface about the camps at Chickamauga. Much of this filth must have been specifically infected with typhoid fever. Sinks were frequently overflowed by heavy rains, and their contents were distributed on the adjoining surface. It is needless to dwell upon this point and we may refer those who desire particulars to the regimental histories that have already been given.

(16) Some commands were unwisely located.

While there is no evidence that any of the places selected for national encampments could be called unhealthful, it is true that some of them were not suited for camp sites. It is quite impossible to keep camps

in a sanitary condition at a location such as that for a while occupied by one brigade of the Fourth Army Corps near Port Tampa, Fla. On account of the nature of the ground and the surroundings, Palmetto Beach was certainly a very unsuitable location for a permanent camp. Every medical officer in the First Division of the Seventh Army Corps condemned Miami, and this condemnation was approved by officers both of the staff and of the line who visited this encampment. The men could not be made comfortable at this place. Notwithstanding these facts there were regiments at Chickamauga that had more cases of typhoid fever than did any of those in the division at Miami, but this is no reason why the troops at the latter place should have been so uncomfortably situated. Some commands were unwisely located for the simple reason that the soldiers could not be comfortably accommodated at the places named. There was, however, a much more serious defect in the location of certain commands. Some regiments at Chickamauga, as we have shown, were so located that they received the drainage of other regimental camps. There was certainly no sufficient excuse for this.

(17) *In some instances the space allotted the regiments was inadequate.*

This was true of more than one command at Chickamauga. For instance, the One hundred and fifty-eighth Indiana (p. 62) was forced to contract its lines to half the regulation distance, and then it was only 30 feet distant from the Sixth Ohio (p. 65). The sinks of the last-mentioned regiment and the kitchens of the First West Virginia (p. 74) were only 12 or 15 feet apart. At Camp Alger the Eighth (p. 324), Twelfth (p. 327), and Thirteenth (p. 331) Pennsylvania were packed closely together, with scarcely an interval between the regiments; tents of the same companies in contact with each other on the sides, and of adjacent companies in contact by the ends. We are forced to conclude from this and numerous similar examples that there were line officers whose efficiency might have been enhanced by some knowledge of camp hygiene.

(18) *Many commands were allowed to remain on one site too long.*

There were regiments at Chickamauga that did not move a tent from the time of arrival in May to that of departure late in August.

(19) *Requests for change in location made by medical officers were not always granted.*

As an illustration under this head we may call attention to the official records of the Fifth Pennsylvania (p. 109). This command reached Chickamauga Park May 20, and it was unfortunately located on low ground. Requests for a change in location were repeatedly sent in during June and July. The soil became muddy, the camp received the washings from other camps above, the sinks rapidly filled with water and overflowed, and still requests for change in location were unheeded until August 12, when the regiment was allowed to occupy a

new camp two miles to the west and on a higher piece of ground.

(20) *Superior line officers can not be held blameless for the unsanitary condition of the camps.*

As we have already seen, some of the regiments were improperly located from a sanitary standpoint. This was done by superior line officers, and sometimes in the face of protests from the medical officers. We have also seen that requests for change in location were disregarded, and regiments were allowed to occupy one site for too long a time. In general, the camps became very filthy. It must, therefore, be admitted, it appears to us, that line officers were to some extent responsible for the condition of the camps under their command. The medical officer can only recommend; the line officer can command. We think it unfortunate that hygiene is not taught in our national military school. It does seem that line officers should be able to recognize the importance of reasonable requests and recommendations made by the medical officers.

(21) *Greater authority should be given medical officers in questions relating to the hygiene of camps.*

In our opinion it is of the greatest importance that more authority be granted medical officers in all matters pertaining to the hygiene of camps.

(22) *It may be stated in a general way that the number of cases of typhoid fever in the different camps varied with the methods of disposing of the excretions.*

This is well illustrated by the methods of disposing of fecal matter and the number of cases of typhoid fever in the three divisions of the Seventh Army Corps. The First Division was most uncomfortably located at Miami, Fla., from the last week in June until the second week in August. On the last-mentioned date it was removed to Jacksonville, where it joined the other divisions. During a part of its stay at Miami, and during the entire period of its encampment at Jacksonville, water carriage was employed for the disposition of fecal matter. The number of cases of probable typhoid fever that developed in the six regiments of this division was 1,030. In the Second Division the tub system of disposing of fecal matter was employed. By this method infected fecal matter was scattered all through the camp. The number of cases of probable typhoid fever that developed in nine regiments of this division was 2,693. In the Third Division regulation pits were used for the disposal of fecal matter. The number of cases of probable typhoid fever that developed in seven regiments of this division was 1,292.

(23) *The tub system of disposal of fecal matter as practiced in the Second Division of the Seventh Army Corps is to be condemned.*

Of all the methods used for the disposal of fecal matter practiced in the national encampments in 1898, this we regard as the most unsatisfactory. The reason for our condemnation of this system has already been given.

(24) *The regulation pit system is not a satisfactory method of disposing of fecal matter in permanent camps.*

Especially is this true in tropical countries, and in temperate climates during the summer time. It is a difficult thing to have soldiers appreciate the necessity of keeping fecal matter covered. As we have elsewhere stated, in many camps orders were issued requiring each man to cover his feces as soon as deposited; but we did not inspect the pits of a regiment in which we did not find exposed fecal matter. Moreover, in our camps in 1898 flies swarmed so numerously that the first droppings of fecal matter were often covered with them before the act of defecation was completed. The pit system may be employed when armies are on the march and stopping at one place for a few days at most, but even then they are sources of danger, and we believe that it is quite impossible to wholly prevent the spread of typhoid fever in camps in which this method of disposing of fecal matter is employed. We have seen how difficult it was to prepare sinks of proper dimensions at Chickamauga, and, furthermore, that it was quite impossible to keep the contents of these sinks properly covered. The clay thrown out in digging the pits hardened in the sun, and when thrown back into the pit on the fecal matter had but little absorptive power, and the result was that fecal matter was constantly exposed. We have also seen that in some of the camps about Tampa it was impossible to dig sinks on account of the height of the ground water. For these reasons we are thoroughly convinced that if epidemics of typhoid fever are to be prevented some other method of disposing of fecal matter in camps occupied for a week or longer must be resorted to.

(25) *In permanent camps, where water carriage can not be secured, all fecal matter should be disinfected and then carted away from the camp.*

For this purpose we have made a special recommendation that galvanized-iron troughs containing milk of lime be used for the reception of all fecal matter and urine, and that the contents of these troughs be removed daily by means of the portable odorless excavator. We are aware of the fact that this method of disposing of fecal matter will be attended by increased cost, but we are confident that it will lessen greatly the number of cases of typhoid fever. We believe that there is no question pertaining to army hygiene of more importance than that relating to the method of disposing of fecal matter and urine. The way in which this is done will largely determine the number of cases of typhoid fever that will develop in any command. We feel, therefore, that we can not be too urgent in our recommendation of the abolition of former methods of disposing of fecal matter and the adoption of some other system of disinfecting all excreta. This system has been adopted by the War Department, and a full description published in General Orders, No. 170, Adjutant-General's Office, Washington, September 26, 1899.^a

(26) *Infected water was not an important factor in the spread of typhoid fever in the national encampments in 1898.*

There were probably local water supplies that became specifically infected with the typhoid-fever bacillus, but infected water was not the great factor in the causation of this disease. It is possible that the piped water at Chickamauga became specifically contaminated. Certainly, the location of the intake pipe in Chickamauga Creek so near the junction of that stream with the Cave Spring Branch, which drained many of the camps, was not justifiable, and it hardly seems possible that the piped water wholly escaped contamination. However, that even at Chickamauga infected water was not the chief factor in the spread of typhoid fever is shown by the fact that regiments which did not drink piped water also became widely infected with the disease, and it is furthermore demonstrated by the fact that the spread of typhoid fever continued after the regiments had been moved to Knoxville, Tenn., and Lexington, Ky., at both of which places the water supply was above suspicion. It is also probable that some of the local water supplies at Chickamauga became specifically contaminated. This might have been true of the wells from which the regiments of the Second Division of the First Army Corps for a while drew their water supply. The location of Jay's Mill well, for instance, was such as to receive the drainage from typhoid fever infected camps near it, and it is not likely that this water escaped specific contamination. We are also inclined to attribute the greater prevalence of typhoid fever in the Third Army Corps to the fact that the sites covered by the regiments of this corps furnished many wet-weather springs, which in all probability were contaminated. That the water was not infected at Jacksonville seems to be beyond question. This supply came from artesian wells more than 1,000 feet deep, and was distributed through the camps by means of pipes. In August and September of 1898 there were, in round numbers, at Jacksonville 30,000 civilians or inhabitants of the city and the same number of soldiers encamped near by. Both civilians and soldiers drank water from the same source. There were only a few sporadic cases of typhoid fever in the city at a time when each of the three division hospitals was receiving a score or more of patients with this disease each day. The same condition existed at Knoxville. Here the soldiers obtained their water supply from the pipes that furnished West Knoxville. We satisfied ourselves from an inspection of the health officer's books that there were no cases of typhoid fever among the citizens at that time, and still there were hundreds of cases among the soldiers.

At Camp Alger certain local water supplies probably became contaminated, but there is no evidence that this was generally true. Each regiment obtained its supply from a bored well, and while there was some question about the wisdom of the location of a few of these, the majority were so situated and so constructed that

^a Crude carbolic acid or any other cheap disinfectant may be used in these troughs instead of the milk of lime, which is not free from objection on account of its caking in the troughs.

infection seemed well-nigh impossible. The same is true of the water supply at Camp Meade.

(27) *To guard against the contamination of the water supply, troops in the field should be provided with means for the sterilization of water.*

Our investigations of the methods of sterilization and cooling water have been given elsewhere. (See Report of the Surgeon-General of the Army, 1899, pp. 215-225.)

(28) *Flies undoubtedly served as carriers of the infection.*

Flies swarmed over infected fecal matter in the pits and then visited and fed upon the food prepared for the soldiers at the mess tents. In some instances where lime had recently been sprinkled over the contents of the pits, flies with their feet whitened with lime were seen walking over the food.

It is possible for the fly to carry the typhoid bacillus in two ways. In the first place, fecal matter containing the typhoid germ may adhere to the fly and be mechanically transported. In the second place, it is possible that the typhoid bacillus may be carried in the digestive organs of the fly and be deposited with its excrement.

Since the above was written Hamilton has demonstrated that the house fly may and does at times transport the typhoid bacillus. The points of investigation may be condensed as follows:

(1) The epidemic of typhoid in Chicago in the summer and fall of 1902 was most severe in the Nineteenth Ward, which with one-thirty-sixth of the city's population furnished more than one-seventh of the deaths.

(2) The concentration of the epidemic in this locality can not be explained by contamination of the drinking water or of food, or on the ground of ignorance or poverty of the inhabitants, for in these respects the Nineteenth Ward does not differ from many other parts of the city.

(3) An investigation of the sanitary conditions of this region showed that many of the street sewers were too small and that only 48 per cent of the houses had sanitary plumbing. In 22 per cent the water-closets had only an intermittent water supply; in 11 per cent privies were connected with the sewers without water supply; in 12 per cent the privies had no sewer connection, and in the remaining 7 per cent the plumbing was defective.

(4) The streets in which the sanitary arrangements were most defective there occurred the largest number of cases of typhoid irrespective of the poverty of the inhabitants.

(5) Flies caught in two undrained privies, on the fences of two yards, on the walls of two houses, and in the room of a typhoid patient were used to inoculate 18 tubes from 5 of which the typhoid bacillus, identified by cultural and agglutination tests, was isolated. (Jour. of Am. Med. Assoc., 40, 576.)

Fischer (Archiv. f. Hygiene, 46, 274) has attempted to determine the duration of life of the typhoid bacillus in the bodies of flies fed on infected material and places it at twenty-three days.

(29) *It is more than likely that men transported infected material on their persons or in their clothing and thus disseminated the disease.*

We have condemned the method which was followed in many of the camps of detailing men from the ranks to act as orderlies at the hospitals. In some of the commands it was customary to detail 100 or more men from the line every morning. These men went to the hospitals, handled bed pans used by persons sick with typhoid fever, and at night returned to their comrades. The most of these men were wholly ignorant of the nature of infection and the methods of disinfection. In fact, at one of the division hospitals we saw orderlies of this kind go from the hospital and partake of their midday meal without even washing their hands. These men handled not only the food which they ate, but passed articles to their neighbors. It seems to us that a more certain method for the dissemination of an infectious disease could hardly have been invented.

We have stated that in some of the camps the surface, especially where there were strips of wood, was frequently dotted with fecal deposits. At the time of our inspection of the Third U. S. Volunteer Cavalry (p. 269) at Chickamauga it was quite impossible to walk through the woods near the camp without soiling one's feet with fecal matter. Much of this was probably specifically infected, and it is by no means improbable that the infection was carried by the men into their tents, where blankets and tentage became infected.

(30) *Typhoid fever, as it developed in the regimental organizations, was characterized by a series of company epidemics, each one having more or less perfectly its own individual characteristics.*

The truth of this statement will be evident after the inspection of the charts showing the distribution of typhoid fever among the companies of the different regiments. On making such an inspection, one must be impressed with the fact so plainly evident there that men who are closely associated develop typhoid fever simultaneously. Men in the same company came down with the disease on the same day. This is still more marked when we study the cases with reference to the tents occupied by the men. Of 1,608 cases of typhoid fever which we have been able to accurately locate in the particular tents in which they occurred, together with the date of commencement of the attack, the results may be summarized as follows:

Directly connectable attacks, 563, or 35.01 per cent.

Indirectly connectable attacks, 447, or 27.79 per cent.

Total connectable attacks, 1,010, or 62.80 per cent.

Certain tents were badly infected and the majority of all their inmates developed the disease, while other tents wholly escaped. Blankets and tentage became soiled

with typhoid discharges, and in this way the disease was propagated and carried by the company wherever it went. We believe, therefore, that personal contact was a very important factor, probably the most important, in the spread of the disease.

That the floors, furniture, and bedding of barracks may become infected with typhoid fever and may continue to endanger the life and health of its occupants for a long time is abundantly shown in the records of military surgeons. The following report by Chour, a Russian medical officer, is an instance: A typhoid epidemic appeared in two infantry regiments garrisoned at Jitomir. All the soldiers of these two regiments obtained their drinking water from the same source. One regiment had in 1885, 9.6, and in 1886, 3.2 per mille cases of typhoid fever. The second regiment had during the same time a similar proportion of cases, but in one company of the second regiment 14 out of 90 men were stricken with typhoid fever. The extraordinary number of cases of this disease in this company led to the supposition that the part of the garrison occupied by these men was specifically infected. In December, 1886, the room occupied by this company was vacated and subjected to thorough disinfection. The walls, the floor, and the furniture of the room, also the clothing of the soldiers, were disinfected. After this had been done this company was allowed to return to its own quarters. In 1887 the number of cases of typhoid fever in this company was reduced to 1.7 per mille, and in 1888 there was not a case. However, during the same time typhoid fever increased among the soldiers occupying parts of the garrison which had not been disinfected. The disappearance of the disease among the soldiers that occupied the disinfected quarters and its persistence and increase among the soldiers in the undisinfected quarters led Chour to conclude that the typhoid bacillus was disseminated through the dust in the rooms. It may be that the bedding and clothing of the soldiers were soiled with typhoid stools, and the bacilli may have been transferred from these soiled articles to the alimentary canal by means of the fingers, or it is possible that the dust from the infected clothing carried the specific bacillus through the air which was inhaled by the occupants of the room. This and other equally striking instances of garrison infection show the necessity of thorough disinfection of quarters infected with typhoid fever.

Our investigations certainly demonstrate that typhoid fever is not only an infectious, but also a contagious disease; that it may be transferred from one person to another by contact, and that the clothing, bedding, and rooms of typhoid patients should be disinfected with as much care as is now given to these matters in cases of diphtheria and scarlet fever.

(31) *It is probable that the infection was disseminated to some extent through the air in the form of dust.*

The shell roads through the encampment at Jacksonville were ground into the finest dust by the heavy army wagons. The scavenger carts carrying the tubs filled with fecal matter passed along these roads, and their course could often be traced by bits of feces falling from the tubs. Other vehicles ground up the fecal matter and dust together, and the winds disseminated these particles here and there. Men inhaled this dust. It was deposited on food in the mess tents by the roadside, and men ate the dust. Pollution of the soil with the urine of those suffering with typhoid fever was of frequent occurrence. Cases of this disease under the diagnosis of malarial fever were repeatedly treated by the regimental surgeon throughout the entire sickness. Patients still convalescing were also returned to their respective companies. Under these conditions there must have been abundant opportunity for contamination of the camp site with the specific germ. We are therefore inclined to the opinion that infected dust was one of the factors in the dissemination of typhoid fever.

Is typhoid fever ever disseminated through the air? This is a question to which diverse answers have been given. Our present knowledge of the etiology of this disease gives no support to the old belief that it may be caused by the inhalation of gases from decomposing organic matter. In the first place, infection can result only from the specific germ, and no amount of decomposing matter in which this organism is not present can cause the disease. In the second place, the specific cause of typhoid fever is a particulate body and not a gas. Inhalation of gases from putrid material may cause intoxication, but not infection. Many of the cases reported by older writers, in which typhoid fever was believed to be due to the inhalation of gases from putrid matter, were, as we can now see, not instances of infection. As an illustration of this, we may mention the Clapham epidemic as reported by Murchison. Twenty out of twenty-two schoolboys, who watched the opening of a pit that contained a large amount of decomposing organic matter and which had been closed for some years, were within three hours prostrated with vomiting and diarrhea. Two died, one within twenty-three and the other within twenty-five hours. Post-mortem examination showed acute swelling of Peyer's patches and the solitary follicles with slight ulceration of these structures, together with congestion of the mesenteric glands. These were diagnosed as cases of typhoid fever, but we now know that they were instances of acute poisoning with noxious gases. In the third place, the typhoid bacillus is generally destroyed by other germs or their products in material sufficiently advanced in putrefaction to give off unpleasant odors. The oldest cultures of the bacillus are free from disagreeable smells, and infection with typhoid fever is not likely to result from ingestion of putrid matter. Unfortunately there is nothing about

food or drink infected with this germ to indicate to the unaided senses the presence of such infection. Water containing the typhoid bacillus may be clear, sparkling, and of pleasant taste. Milk infected with this micro-organism reveals no peculiarities either to taste or sight. A fly may deposit typhoid bacilli upon a cooked potato without rendering this article of food less palatable to the consumer. We wish to emphasize the difference between the question now before us as to whether or not typhoid fever may be disseminated by infected particles of dust carried through the air and the older idea that it was spread by the agency of gases given off from putrid material. Such gases are generally germ free. In fact, we may state as a bacteriological axiom that gases given off from putrefying organic matter contain no germs. Certainly this is generally true, and we know of no exception. On the other hand, a wind may carry partially dry infected particles of dust which may be deposited on food or inhaled and cause typhoid fever. However, we are reaching a conclusion before stating arguments. The question is whether or not typhoid fever may be disseminated through the air. Germano has collected the literature bearing upon this question and has also added experimental data of his own. We will give a brief summary of the statements made by this author and see what conclusions he has drawn therefrom and whether or not we can agree with him in these conclusions.

In reviewing the literature of air-borne typhoid fever, Germano first cites the article by the Russian military surgeon, Chour, concerning the garrison at Jitomir, to which we have already referred. We have pointed out that Chour's conclusion that the typhoid bacillus was disseminated through the dust in the rooms of the garrison is not altogether justified. It may be that the bedding and clothing of the soldiers were soiled with typhoid stools, and the bacilli may have been transferred from these soiled articles to the alimentary canal by means of the fingers. Of course it is possible that the dust from the infected clothing, or that deposited on the floor, walls, or furniture, did carry the specific bacillus through the air which was inhaled by the occupants of the room. Certainly it must be admitted that the report of this epidemic is of value and shows the necessity of the thorough disinfection of quarters infected with typhoid fever; but it does not furnish positive proof that the infection was carried through the air.

The second citation by Germano is a report by Favier. On August 26, 1886, a regiment of dragoons in which there had been no typhoid fever left Compiegne for the annual maneuvers. From the above-mentioned date until September 6 of the same year one half of this regiment was quartered at the village of Cuvilly, while the other half was divided between Neuville and Ressous. On the last-mentioned date the troops reunited at Compiegne. On September 11 a dragoon who had been quartered at Cuvilly was taken with typhoid

fever. From this time up to October 2 of the same year 8 other cases appeared in this half of the regiment, while only 2 cases appeared in the other half, and the first of these had its initial date October 5. Investigations show that during the stay of the troops at Cuvilly there were 3 cases of typhoid fever in a family at that place. The soldier who first contracted typhoid fever had been quartered in this house, and the next 2 cases to develop this disease were men who had visited this house. Favier concludes that typhoid fever was spread in these cases through the air. He thinks that the man quartered in the infected house at Cuvilly received the infection through the air inhaled at that place, and that the soldiers visiting this house were infected in the same way, and that the disease spread to the half of the regiment which had not been at Cuvilly through the air. It seems to us that this conclusion is by no means warranted in any of these cases—at least such a conclusion does not necessarily follow from the facts as stated above. The soldier quartered at the house of the sick may have been infected by personal contact with the sick, through his drinking water, or through his food. All of these possible methods of infection are also applicable to the men who visited this house. These men may have carried the infection in their clothing or on their persons to their comrades who had not visited the house. When the halves of the regiment were united in the common barracks at Compiegne, common drinking cups may have become infected by personal contact and may account for the spread of the disease. For these reasons we are inclined to reject this report as evidence that typhoid infection may be disseminated through the air.

The third report cited by Germano is equally unsatisfactory. Ollivier states that a girl sick with typhoid fever was placed in a hospital ward in which there were no other cases of this disease. Soon thereafter two other patients in the same ward developed typhoid fever. One of these occupied the bed by the side of the first patient and the other a bed opposite. In order to prevent further dissemination of the disease the ward was vacated and thoroughly disinfected. The disinfection of the ward was certainly justified, but the conclusion that the disease was spread through the air is by no means warranted. It is more than probable that attendants carried the germs on soiled fingers from one patient to the other. The history of these cases teaches, as similar instances likewise indicate, that it is not safe to place typhoid-fever patients in a ward occupied by those suffering from other diseases; or, in other words, it teaches the desirability of the isolation of typhoid cases, but certainly it furnishes no positive proof that typhoid fever may be disseminated through the air.

Lecuyer describes a small epidemic of typhoid fever in Vassognes, in which village there had not been a case of this disease for several years. The corpse of a woman who had died from typhoid fever at Rheims was brought

to Vassognes for burial. The body had not been embalmed and was transported in a simple wooden coffin and at the time of burial was in an advanced stage of decomposition. A few days later three children of the dead woman came from Rheims to Vassognes. These soon sickened with typhoid fever, and the disease spread until it had infected many other persons in the village. The author concludes from the fact that Vassognes had long been free from typhoid that the germs were disseminated through the air. His conclusion that the water of the village was not the source of infection is justified, but his belief that the disease was spread through the air is only an assumption. Soiled hands and clothing were more likely factors in the spread of the infection.

Dewolz reports certain cases that occurred at Eaux Bonnes. In July, 1886, a woman from Paris came to a hotel in this village, where she soon developed typhoid fever. The disease ran a normal course, and terminated after four weeks in recovery. A short time after this, three daughters of the proprietor of the hotel were taken sick with typhoid fever. Beyond these cases the epidemic did not spread. Before the coming of the woman from Paris there had been no case of typhoid fever in the village. Bacteriological examination of the drinking-water supply showed it to be of unquestionable purity. The air of the room occupied by the girls communicated through a covered passage with that of the sick chamber of the woman. Moreover, the door of the privy in which the dejections of the sick woman were thrown, without disinfection, opened into the same passage. The author concludes that the disease germs were carried through the air. This conclusion does not necessarily follow. It may have been that those attending the sick woman handled the food of the children without disinfecting their hands.

Passing over a number of other reports collected in the review of the literature by Germano, we come to that of Froidboise. The military station of St. Bernard lies about 2 miles south of Antwerp and 1,800 meters from the point where the Rupel flows into the Schelde. Usually there are four regiments of infantry located at this place. For three years there had not been a case of typhoid fever among the soldiers in these barracks, when in August, 1892, a severe epidemic appeared. The initial date of the first case was August 22 and of the last case October 20. The water supply was not changed nor were the barracks disinfected. The explanation given by Froidboise is as follows: On account of some engineering work which was being done in the Schelde, at the mouth of the Rupel, the latter stream overflowed its left bank and distributed a large amount of sewage brought down from Brussels and Mechlin. The receding water left a thin deposit scattered over several thousand acres of land. As this deposit consisted of sewage from Brussels and Mechlin, it is more than likely that it contained the typhoid bacillus in

large numbers. As has been stated, the epidemic began August 22 and ended October 20. From August 12 until October 10 the direction of the prevailing wind was such that it would carry the dust from the drying deposit toward and into the garrison. Before and after the dates mentioned above, the wind was in the opposite direction. It seems to us that this is the most interesting report among those collected from medical literature by Germano. As has been stated, the water supply to the soldiers in the barracks was not changed before, during, or after the epidemic. Neither could the disappearance of the disease be attributed to disinfection, because this was not practiced. The question is whether or not the typhoid bacillus can be carried in particles of dust suspended in the air through a distance of 1,800 meters. Germano concludes that this is impossible, but we will return to this question later.

Germano quite properly divides the above-mentioned and similar reports collected by himself into three groups. In the first group he places those instances in which it was probable that the disease was disseminated by direct contact with the sick, leading to soiling of the hands or clothing with the infected dejections. In the second group, he thinks that indirect contact through persons with soiled hands or through infected clothing or bedding or other agents is a more likely explanation than dissemination through the air. As an instance of cases coming in the second group we will give one reported by Gielt. A man while away from home contracted typhoid fever and returned to his native village, in which there had not been a case of this disease for a long while. The undisinfected feces from this man were thrown upon a dung heap. Some weeks later 5 men carted away this material and later 4 of these developed typhoid fever and the fifth suffered from intestinal catarrh, accompanied by enlargement of the spleen. The undisinfected dejections from these men were thrown upon another dung heap. A few months later 2 men removed this material, and of these 1 developed typhoid fever. Brouardel, who reported these cases for Gielt, supposes that the typhoid bacilli were disseminated through the air from decomposing dung heaps. Germano thinks it more probable that the men engaged in this work soiled their hands and in this way transferred the bacilli to their mouths. This is highly probable, but certainly we can not positively state that particles of dust were not inhaled by the men who were engaged in loading and unloading the infected material. In order to arrive at any opinion concerning the probability between the possible avenues of infection in these cases, we would have to know more than we do concerning the amount of moisture in the material when it was removed and the strength of the wind prevailing at the time. In the third group Germano places those cases in which the germs are supposed to be disseminated through the air, because no other explanation seems probable; but he states that in many epidemiological investigations the

cause of the spread of the disease remains unknown, because we can not ascertain all the conditions.

After reviewing the literature as stated above, Germano endeavors to decide the question concerning the possible dissemination of typhoid bacilli through the air experimentally. In his investigations he finds that typhoid bacilli mixed with dust from different sources and thoroughly desiccated speedily dies, and he concludes that air infection through many hundred meters, as supposed by Froidboise in the cases that occurred in the military garrison near Antwerp, is impossible. In our opinion Germano's experiments confirm what was already well known, that the typhoid bacillus is speedily deprived of life by desiccation, but they do not convince us that dissemination of the living germ in particles of partially dried dust may not be carried even distances of several hundred meters and deposited upon the food, in the drinking water, or inhaled.

More recently, Neisser has shown that dust infected with the typhoid bacillus may be carried by a current of air moving at a rate of 1.7 centimeters per second through a distance of 680 centimeters and there deposited with the germ, still possessed of vitality. However, he concludes that since this germ is not transported to a distance of more than 680 centimeters by the air moving at a rate which generally prevails within a room, that typhoid fever can not be considered a dust disease, but is nearly so. It will be seen that this conclusion has reference only to the possibility of the typhoid bacillus floating through the air of a closed room; but even within doors the air often moves with a velocity many times greater than 1.7 centimeters per second. Especially is this true when the movement of the air within the room is influenced by drafts from windows, doors, and ventilating flues. Thus we find that there is a possibility of typhoid infection from the inhalation of the air of a room in the dust of which the specific bacillus of this disease exists. Partially dried typhoid stools on the floor may be sufficiently comminuted to form an infected dust, which may float through the air, be deposited on food, find its way into uncovered receptacles of water or milk, or be directly inhaled, find lodgment in the nose and pharynx, and finally reach the intestines.

While all of this is possible within a closed room, the danger of air infection with typhoid fever must be greatly increased in military life, where food and drink are often exposed for hours to an atmosphere laden with dust, possibly infected with the typhoid bacillus. As we have had occasion to state, the surface of the ground about many of the regimental encampments at Chickamauga in 1898 was so covered with fecal matter that it was impossible to walk through these places without soiling the feet. So prevalent was typhoid fever at Chickamauga that much of this fecal matter must have contained the Eberth bacillus, and it seems hardly possible that the great clouds of dust in which the men lived could have been free from this infection.

The shell roads through the encampments at Jacksonville were ground by the heavy army wagons into an impalpable dust several inches thick. Along these roads scavengers carted in half barrels fecal matter containing the typhoid bacillus. The contents of these tubs frequently splashed over and fell in this dust. On each side of these roads soldiers were encamped, and many mess tables were in close proximity to the roads. Local whirlwinds sometimes caught up large quantities of this dust and carried it considerable distances. After seeing these things we feel that we can not exclude the dust as a probable carrier of the typhoid infection, notwithstanding the fact that it would probably be a very difficult thing to scientifically demonstrate that the disease was disseminated in this way.

(32) A command badly infected with typhoid fever does not lose the infection by simply changing location.

We do not mean to say that it is not advantageous for a regiment badly infected with typhoid fever to change its location. On the other hand, in our history of the Second Division of the First Army Corps we have shown that such change is of advantage and may be followed by a reduction in the number of cases; but mere change in location is not sufficient to stamp out the disease in a command after it has become widely disseminated. The histories of many regiments show this to be true. The Second Division of the First Army Corps became badly infected with typhoid fever at Chickamauga; later it moved to Knoxville, Tenn. At the latter place the location was an ideal one. The water supply was above suspicion; the surface gently rolling and the natural drainage good. The soil was deep, and pits of proper depths were easily constructed. Soil thrown out in digging the pits dried in the sun and became highly absorptive, so that when thrown back upon the fecal matter it took up the moisture readily. Notwithstanding all these favorable conditions typhoid fever continued, and instead of showing the slightest abatement increased in prevalence. The regiments that went from Chickamauga to Lexington, Ky., had a similar experience, although it is not so marked in these, because they had been more severely affected at Chickamauga, and a larger proportion of the susceptible material had been used up. The regiments of the First Division of the First Army Corps that went to Porto Rico carried the infection along with them, but with little if any abatement. Numerous other illustrations equally striking might be given.

(33) When a command badly infected with typhoid fever changes its location it carries the specific agent of the disease in the bodies of the men, in their clothing, bedding, and tentage.

This is shown by the fact that when commands changed location, leaving behind them all their sick, and when they went to places free from the infection the disease continued with them.

(34) *Even an ocean voyage does not relieve an infected command of its infection.*

This is shown to be the case in the study of the various commands that went to Cuba and Porto Rico. The regiments constituting the Fifth Army Corps, that went from Tampa to Santiago in June, were not widely infected before embarkation, and some of them were on board ship for sixteen days and yet all developed one or more cases either on the way or soon after reaching Cuba. The regiments that went from Chickamauga were widely infected before leaving this country, and the disease continued after their landing with but little if any abatement.

(35) *After a command becomes badly infected with typhoid fever changes of location, together with thorough disinfection of all clothing, bedding, and tentage is necessary.*

Even when disinfection is carried out, as here suggested, the command will not altogether lose its typhoid infection, because some of the men will carry the germs of the disease in their bodies. Change of location removes the command from the infected locality; disinfection of clothing, bedding, and tentage destroys the infected material deposited upon these articles, but the germs that have already been introduced into the bodies of men are not so easily reached. The utility of disinfection of clothing, bedding, and tentage was demonstrated by Colonel Girard, who carried out this procedure in some of the most seriously infected regiments at Camp Meade with gratifying results.

(36) *Except in case of the most urgent military necessity one command should not be located upon the site recently vacated by another.*

This principle holds good even when the vacating regiment is not known to have suffered from any infectious disease. This axiom in military hygiene was frequently violated during the summer of 1898. In many of the State encampments the regiments that responded to the second call were located on sites recently vacated by commands that had proceeded to the national encampments. This was true of the Fifteenth Minnesota, the Thirty-fifth Michigan, and the Two hundred and third New York, each of which had as many cases of typhoid fever as any one of the regiments in the great national encampments. The Third Illinois at Chickamauga was located upon ground which had recently been vacated by the Sixteenth U. S. Infantry. The regular regiment had occupied this site only eight days, and during this time had reported no sickness, but soon after it reached Tampa it developed 13 cases of acute intestinal catarrh, 3 cases of diarrhea, and 3 cases of typhoid fever. When the Second Brigade of the First Division of the First Army Corps reached Chickamauga Park, the site selected for the regimental camp of the Third Illinois occupied a part of the recently vacated by the Sixteenth U. S. Infantry, while the other regiments of this brigade were placed some dis-

tance away. This brigade remained at Chickamauga until July 22, during which time the Third Illinois developed 60 cases of typhoid, the Fourth Pennsylvania 26 cases, and the Fourth Ohio 19 cases. Additional instances of this kind have been given in the body of our report.

The experiments that have been made in order to determine the longevity of the typhoid bacillus in the soil have yielded widely different results. This is explained by the fact that no two investigators have experimented under exactly the same conditions. After the Franco-German war it was found that typhoid fever continued to prevail for some years in German garrisons in which German soldiers or French prisoners sick with typhoid fever had lived. One interesting case of this kind may be referred to. In this instance an epidemic of typhoid fever began among German soldiers located in a certain garrison on April 4, 1872. During the war these barracks had been occupied by French prisoners among whom typhoid fever had prevailed. Large sinks had been filled with the undisinfected stools of the prisoners, and when full these pits, which were located just outside the barracks, were covered in with thin layers of earth. The water of a well near by had probably become infected from these sinks and caused the epidemic in the garrison in 1872. These old sinks were cleaned out and the well closed. Four days later the last case of typhoid fever occurred in this garrison.

Interesting experiments have been made in England for the purpose of determining the longevity of the typhoid bacillus in soil. Martin took specimens of dirt from various sources. Some of these samples were obtained from localities where it was known that the soil was largely contaminated with organic matter and where typhoid fever had been endemic; others were obtained from places which had not been contaminated by sewage or in any other way. These samples of soil were pulverized, placed in Erlenmeyer flasks and sterilized, after which they were inoculated with cultures of the typhoid bacillus. It was found that the Eberth bacillus grew luxuriantly in the polluted earth, and that flasks containing this soil showed active growths of this micro-organism after a lapse of 105 days. The results obtained with the unpolluted earth were quite different. In these soils the germ not only failed to multiply, but after a short time it died out.

Investigations by Klein indicate that the process of nitrification as it goes on in soil favors the growth and development of the typhoid bacillus. Klein had ascertained, as others before him had done, that sewage is not a suitable medium for the growth of this bacillus, but subsequently he found that by the addition of nitrates to crude sewage the latter is converted into a more suitable medium for the growth of this organism. In fact, in this modified sewage the typhoid bacillus grows abundantly.

Robertson selected a grass-covered field for his investigations. Patches of turf were cut and removed from the subjacent soil. At one place the ground immediately below the turf was watered with the bacillus, after which the turf was replaced. In another locality 9 inches of the earth beneath the turf was removed and the Eberth bacillus sown at this depth; while in a third experiment the germ was placed at a depth of 18 inches, the soil, which had been removed, being carefully replaced after depositing the germ. One hundred and thirty days after this had been done the soil under the turf of the infected localities was removed and examined. Robertson found that in all cases the bacilli had not only retained their vitality, but had multiplied. In the locality where the germ had been placed 18 inches beneath the surface it had grown through the earth above it, where it was found widely and abundantly distributed. Some of these plantings were made in July, 1895. During the cold months of the following winter no typhoid bacilli could be obtained from the soil in which they had been deposited. During the following spring these spots were treated with dilute sterile broth in order to furnish material for the growth of the germ, and, furthermore, for the purpose of rendering the conditions similar to those existing in cases of pollution with sewage. It was found in the following June, nearly a year from the time of the planting of the germ, that those localities which had been properly fertilized with the beef broth furnished an abundant crop of the germ, while areas which had not been so fertilized failed to show any growth.

These experiments indicate that a polluted soil when once infected with the typhoid bacillus may retain the infection for a long time, and they are quite in accord with military experience, inasmuch as it has frequently been found that a healthy regiment may speedily develop this disease after occupying a site vacated by an infected command. The history of typhoid fever among the troops during the war of the rebellion furnishes instances of this kind, one or two of which may be mentioned.

The Twenty-third Massachusetts, numbering 900 men, left Massachusetts in November, 1861, and were encamped at Annapolis, Md., until January 8, 1862, the record of health being good during this time. The regiment arrived at Roanoke Island February 7, 1862, from whence it embarked to Newbern, N. C., arriving at this place March 14, 1862. According to the report of the regimental surgeon, George Derby, the health of the regiment, in spite of exposure to many hardships, had been good. Arriving at Newbern the regiment occupied an encampment, including tents, abandoned by a Confederate regiment that had suffered severely from typhoid fever. The disease soon appeared among the men of the Massachusetts regiment (the number of days before the appearance of the first case is not stated), and during the month of April, 1862, 300 cases developed and 22 deaths occurred.

On March 7, 1862, the Tenth New York Cavalry moved into barracks at Perryville, Md., which had recently been vacated by the Fourteenth U. S. Infantry. The latter regiment had suffered largely from typhoid fever during the month of February, 1862. The barracks were thoroughly cleaned, drains opened and improved, and an excellent spring, which was exempt from any source of pollution, was found. The Fourteenth Infantry had used water from a well only 6 feet deep and this had been supposed to be the source of the typhoid fever. Notwithstanding the precautions taken by the New York regiment, diarrhea and so-called malarial fever soon appeared. On March 26, 1862, the New York regiment was moved across the bay to Havre de Grace, and the following morning numerous cases of so-called remittent fever reported at sick call and soon diarrhea became epidemic in the command. The monthly report of sick and wounded for April shows 28 cases of remittent fever and 2 cases of typhoid fever. It can hardly be doubted that all these cases of fever were in reality typhoid, and that they were contracted through the occupancy of an already infected locality.

The following illustrates British experience in India bearing on this point: In January, 1890, a battalion of a South Wales regiment occupied a certain site at Bareilly, and while there suffered severely with typhoid fever. On account of this outbreak this battalion was moved to another location. In the following November a battalion of the Royal Munster Fusiliers came to Bareilly and was located on the spot occupied by the South Wales regiment nine months before. Within three weeks after occupation of this locality by the Fusiliers cases of typhoid fever began to develop. After consultation it was decided to move the camp $1\frac{1}{2}$ miles farther west; when this was done the epidemic abated.

(37) *The fact that a command expects to change its location does not justify neglect of proper policing of the ground occupied.*

The filthy condition of many of the regimental camps at Chickamauga was explained on the ground that each regiment expected to be called to the front in a few days and therefore neglected camp sanitation. It is needless for us to say that the explanation does not justify the neglect. A camp site should be thoroughly policed up to the moment of vacating it. This should be insisted upon as a matter of military discipline, and camp commanders should regard proper attention to the sanitation of the site occupied by their troops as one of their highest duties and its neglect as a crime.

(38) *It is desirable that the soldier's bed should be raised from the ground.*

In some of the regiments at Camp Alger the tents were never floored. On inspecting these commands in August we found dust several inches deep in the tents. During the daytime, in fair weather, the blankets were taken out, and men, possibly with their feet soiled with infected material, walked around in the dust and at night

threw the blankets down on it and there slept. At other encampments flooring was purchased with regimental funds. We admired the enterprise of the men in some regiments who built in their tents a scaffold of poles, covered this with straw, and made their beds on this. We can not but think that sleeping in a dust pile, which was possibly infected with typhoid stools, was not wise.

(39) *In some of the encampments the tents were too much crowded.*

This was true both of the space allowed for the tents and of the number of men occupying each tent. In some instances the tents of the same company were so close together as to leave no space between them, and those of two adjacent companies were crowded together back to back. Inasmuch as none of these commands were in the vicinity of any hostile camp, this overcrowding seems to have been wholly unnecessary. Medical officers should vigorously remonstrate against arrangements of this kind. In some of the commands at Chickamauga the tents were not shifted, but stood continuously on the one spot where they were pitched in May until the command left late in August.

(40) *Medical officers should insist that soldiers remove their outer clothing at night when the exigencies of the situation permit.*

With from 12 to 16 men in a tent, all sleeping in their clothes worn during the day, and possibly with some of them soiled with infected fecal material, the effect upon the general health certainly could not be beneficial, and the possibility of the dissemination of infection must be admitted. If privates in the ranks would give more attention to personal cleanliness, and if they were furnished with quarters in which they could keep themselves clean, typhoid fever and other infectious diseases among troops in the field would be greatly decreased. Our investigations show that tent infection was an important factor in the distribution of typhoid fever.

(41) *Malaria was not a prevalent disease among the troops that remained in the United States.*

We have shown in the body of this report that blood examinations for the plasmodium of malaria made by competent men at Camp Alger (p. 371), Chickamauga (p. 300), Knoxville (p. 300), Camp Meade (p. 479), and Jacksonville (p. 637) show that malaria was a very rare disease among the troops that remained in the United States. This disease was undoubtedly more common in some of the camps than the blood examinations would indicate, because these were made for the most part on hospital patients and not upon those who merely reported to the regimental surgeon, were given quinine, and returned to duty in a day or two. The malaria that did exist in the national encampments in this country yielded readily to quinine, and the cases that did not yield to this treatment were not malarial. It is unfortunate for scientific medicine that a competent man,

properly equipped for making blood examinations, was not stationed at each division hospital at the time of its organization. Certainly we have a right to expect that the Government will use the best and the most scientific methods in its Army medical service. Had this been done scientific medicine would have been enriched by contributions of the greatest value. Is it too much to ask that a division hospital be furnished with facilities for scientific diagnosis equivalent to those possessed by all first-class civil hospitals?

(42) *The continued fever that prevailed among the soldiers in this country in 1898 was typhoid fever.*

There is no evidence that any other continued fever was found among the troops that remained in the United States. We have mentioned the claim of one surgeon that dengue prevailed in his regiment at Chickamauga. We think it quite impossible for dengue to have prevailed in one regiment while all other troops of two army corps encamped at the same place escaped this disease. It was claimed by some that the continued fever prevalent at Chickamauga differed from typhoid fever, and that it was a disease peculiar to the place, and it was designated as "Chickamauga fever." That the continued fever prevalent in our camps in 1898 was typhoid fever is demonstrated by the following facts:

(a) When the temperature curve was not vitiated by the use of antipyretics it was that of typical typhoid fever.

(b) The fever was not broken or arrested by the administration of quinine.

(c) The death rate was that of typhoid fever.

(d) Whenever a post-mortem examination was made, and the total of these examinations was considerable, the characteristic lesions of typhoid fever were found.

(43) *In addition to the recognized cases of typhoid fever, there were many short or abortive attacks of this disease which were generally diagnosed as some form of malarial fever.*

While entertaining the opinion that many of the short febrile attacks were due to errors in diet, as our own investigations proceeded we strongly inclined to the belief that a considerable proportion of these fevers of short duration were due to infection with the typhoid bacillus, and hence were to be considered as cases of mild or abortive typhoid fever. In other parts of this report we have called attention to the coincident rise and fall of these supposed malarial fevers with the occurrence of recognized typhoid fever in certain companies and regiments. Our studies have shown that those soldiers who had recovered from these supposed malarial fevers of short duration afterwards possessed a relatively marked immunity against typhoid fever, as compared with those who had not suffered with these milder fevers. The following table gives the result of our investigation bearing on this point in forty-eight regiments of the Second and Seventh Army Corps:

Table showing, for forty-eight regiments of the Second and Seventh Army Corps, the cases of typhoid fever among men with or without preceding malarial diseases.

Camp.	Number of regiments.	Mean strength.	Cases of malaria.	Typhoid fever with preceding malaria.		Men in regiments not having had malaria.	Typhoid fever without preceding malaria.		Total cases of typhoid fever.
				Number of cases.	In 100 malarial cases.		Number of cases.	In 100 individuals who had no malaria.	
Alger.....	19	21,988	4,083	63	<i>Per cent.</i> 1.5	17,905	1,888	<i>Per cent.</i> 10.5	1,951
Jacksonville.....	7	7,990	2,366	46	1.9	5,624	1,246	22.1	1,292
Meade.....	13	15,092	1,430	72	5.0	13,662	2,305	16.9	2,377
Jacksonville.....	9	10,759	1,676	81	4.8	9,083	2,044	22.5	2,125
Total.....	48	55,829	9,555	262	2.7	46,274	7,483	16.1	7,745

Thus, in a mean strength of 55,829 men there were 9,555 who had experienced attacks of fever, which was generally designated as some form of malarial disease, most frequently as malarial remittent fever. Of this number only 262, or 2.7 per cent, suffered from subsequent attacks of typhoid fever. On the other hand, of 46,274 men who did not experience any attack of supposed malarial fever 7,483, or 16.1 per cent, contracted typhoid fever.

(44) *While our examinations show that coincident infection with malaria and typhoid fever may occur, the resulting complex of symptoms are not sufficiently well defined and uniform to be recognized as a separate disease.*

We have in the body of this report devoted a special chapter to this subject, to which those desiring detailed information are referred (p. 645).

(45) *About one-fifth of the soldiers in the national encampments in the United States in 1898 developed typhoid fever.*

Among 107,973 officers and men in 92 regiments, the records of which we have carefully studied, the number of cases of typhoid fever, according to our estimate, was 20,738. This is equivalent to 19.26 per cent.

(46) *Army surgeons correctly diagnosed about half the cases of typhoid fever.*

The total number of probable cases of typhoid fever among the 92 regiments studied was 20,738. Of these, 10,428, or 50.27 per cent, were diagnosed as typhoid fever either by regimental or hospital surgeons. Most of the cases improperly diagnosed were sent to general military hospitals or to civil hospitals with the diagnosis of malaria. In 80 out of 85 cases sent from the Fifth Maryland to civil hospitals in Baltimore, the diagnosis was changed from malaria to typhoid fever. Out of 98 cases sent from the Eighth New York to hospitals in New York City on September 9 all were recognized as typhoid fever by the physicians in charge of the hospital, while the majority of these cases had been entered on the sick reports under other diagnoses. Of 101 cases of fever transferred to the hospitals at Hartford and New Britain, Conn., by the First Connecticut Infantry, on its departure from Camp Alger, Va., September 7, 1898, 98 received the diagnosis of typhoid fever and

only 3 the diagnosis of malaria. The failure of the regimental surgeon to properly diagnose many cases of typhoid fever is easily explained. Orders required, very properly, that every man sick for forty-eight hours should be sent to the division hospital. It will be seen from this that the cases were not under the observation of the regimental surgeon for a sufficient time for him to make a diagnosis. There is also some excuse for the failure of the surgeons at the division hospitals to recognize all cases of typhoid fever. Many of the less severe of these cases remained in hospital for a short time and were furloughed home or forwarded to some general hospital. Moreover, we have shown in the body of our report that in recognizing nearly half the cases of typhoid fever the army surgeon probably did better than the average physician throughout the country does in his private practice.

(47) *The percentage of death among cases of typhoid fever was 7.61.*

Of the 20,738 cases already mentioned as occurring in 92 regiments, 1,580 died. This gives a death rate of 7.61 per cent. This corresponds closely with the death rate for typhoid fever in those places in which most accurate records have been kept. In the city of Hamburg during the years 1886 and 1887 there were 10,823 cases, with a death rate of 8.5 per cent. In 1897 there were 1,885 cases at Maidstone, England, with a death rate of 7.5. Brandt has collected 19,017 cases treated by cold baths, with a mortality of 7.6 per cent. Of 2,293 cases treated in some of the larger hospitals in this country in 1897, 9.24 per cent died.

(48) *When a command is thoroughly saturated with typhoid fever it is probable that one-fourth to one-third of the men will be found susceptible to this disease.*

We are inclined to the opinion, but desire to state it only as an opinion, that typhoid fever disappeared in some of the regiments only after all the susceptible material had been exhausted. This was probably true in all regiments which had 400 or more cases.

(49) *In military practice typhoid fever is often apparently an intermittent disease.*

We have stated that typhoid fever is often apparently an intermittent disease. We do not mean that the apparent intermissions are afebrile; we only mean that

the men sick with this disease had periods of improvement, and these were so marked that regimental surgeons sometimes returned to duty, probably at the request of the men, those who were sick with typhoid fever.

(50) *The belief that errors in diet with consequent gastric and intestinal catarrh induce typhoid fever is not supported by our investigations.*

This belief, which was formerly held by many, is founded upon false conclusions arising from erroneous conceptions of the etiology of the disease. Moreover, the early symptoms of typhoid fever are often confounded with those of simple gastro-intestinal catarrh.

(51) *The belief that simple gastro-intestinal disturbances predispose to typhoid fever is not supported by our investigations.*

As has been elsewhere stated, the members of this board began their investigations with the belief, which

seems to be quite generally held, that acute diseases of the gastro-intestinal tract render the individual more susceptible to subsequent infection with typhoid fever. However, our studies have forced us to come to the following conclusions concerning the relations between typhoid fever and preceding temporary disorders, including those diagnosed as diarrhea, enteritis, gastro-enteritis, gastro-duodenitis, intestinal catarrh, gastro-intestinal catarrh, gastric fever, and simple indigestion:

(a) The temporary gastro-intestinal disturbances of May and June had little if any effect upon subsequent infection with typhoid fever.

(b) The temporary gastro-intestinal disturbances of July and August, instead of predisposing to typhoid fever, gave a certain degree of immunity against subsequent infection with this disease. Our investigations may be summarized as follows:

Table showing for forty-eight regiments of the Second and Seventh Corps cases of typhoid fever among men with or without preceding diarrheal diseases.

Camp.	Number of regiments.	Mean strength.	Diarrheal diseases.		Cases of diarrheal diseases followed by typhoid fever.		Number of men who had no preceding diarrheal.	Typhoid fever without preceding diarrheal diseases.		Total cases of typhoid fever.
			Number of cases.	Number of individuals.	Number of cases.	In 100 men with preceding diarrheal.		Number of cases.	In 100 individuals who had no diarrheal.	
Alger	19	21,988	5,354	3,894	174	4.4	18,094	1,777	9.8	1,951
Jacksonville	7	7,990	2,370	1,877	131	6.9	6,113	1,161	18.9	1,292
Meade	13	15,092	2,048	1,857	179	9.1	13,235	2,198	16.6	2,377
Jacksonville	9	10,759	2,056	1,853	164	8.8	8,906	1,961	22.2	2,125
Total	48	55,829	11,828	9,481	648	6.8	46,348	7,097	15.3	7,745

It will be seen that of 9,481 men who had previous diarrheal attacks, 648, or 6.8 per cent, contracted typhoid fever; whereas of 46,348 soldiers who had no preceding diarrheal, 7,097, or 15.3 per cent, developed typhoid fever.

(52) *In a considerable per cent (a little more than one-third) of the cases of typhoid fever which are recorded as having been preceded by some intestinal disturbance, the preceding illness was so closely followed by typhoid fever that we must regard the former as having occurred within the period of incubation of the latter.*

For particulars on this point see, for instance, the history of the First West Virginia.

(53) *More than 90 per cent of the men who developed typhoid fever had no preceding intestinal disorder.*

In 7,745 cases in which this point was especially investigated 7,097 (91.63 per cent) were not preceded by any intestinal disorder.

(54) *The deaths from typhoid fever were 86.24 per cent of the total deaths.*

(55) *The morbidity from typhoid fever per 1,000 of mean strength was a little less than one-fifth (192.65).*

The highest morbidity was in the case of the Forty-ninth Iowa Infantry, and the lowest in the Second Pennsylvania Infantry, a regiment which never reached a national encampment.

(56) *The mortality from typhoid fever per 1,000 of mean strength was 14.63.*

The following table contains data illustrating these points:

Command, etc.	Number of regiments.	Mean strength.	Cases of typhoid fever.		Deaths from typhoid fever.	Deaths from all diseases.
			Certain.	Certain and probable.		
First Army Corps (Chickamauga)	22	27,380	2,912	5,921	344	397
Third Army Corps (Chickamauga)	17	20,568	1,741	4,418	417	469
Fourth Army Corps (Tampa)	7	7,507	440	1,498	99	112
Second Army Corps (Alger)	18	19,807	1,807	2,226	212	259
Second Army Corps (Meade)	12	13,962	1,799	2,690	150	168
Seventh Army Corps, Second Division (Jacksonville)	9	10,759	1,729	2,693	248	281
Total	85	99,983	10,428	19,446	1,460	1,686
Seventh Army Corps, Third Division	7	7,990	.....	1,292	120	146
Grand total	92	107,973	.....	20,738	1,580	1,832

Command, etc.	Number of regiments.	Deaths from typhoid fever in 100 cases.		Percentage of deaths from typhoid to deaths from all diseases.	Morbidity of typhoid fever in 1,000 mean strength.		Deaths from typhoid in 1,000 of mean strength.
		Certain typhoid.	Certain and probable type.		For certain cases of typhoid.	For certain and probable cases of typhoid.	
First Army Corps (Chickamauga).....	22	11.46	5.64	84.13	106.35	216.25	12.19
Third Army Corps (Chickamauga).....	17	23.95	9.43	88.91	84.64	214.79	20.27
Fourth Army Corps (Tampa)	7	22.50	6.60	88.39	58.61	199.54	13.17
Second Army Corps (Alger).....	18	11.73	9.52	81.87	91.23	112.38	10.70
Second Army Corps (Meade).....	12	8.33	5.57	89.28	128.84	192.67	10.74
Seventh Army Corps, Second Division (Jacksonville)	9	14.34	9.20	88.25	160.70	250.30	23.05
Total	85	14.00	7.50	86.59	104.29	194.49	14.60
Seventh Army Corps, Third Division	7	.....	9.28	82.19	.....	161.70	15.01
Grand total.....	92	.....	7.60	86.24	.....	192.65	14.63

(57) *The average period of incubation in typhoid fever is probably about ten and a half days.*

Our data are not sufficient to enable us to make any positive deduction on this point, but from a careful study of 780 cases of typhoid fever in which the period

of incubation was based upon the average interval between connectable typhoid attacks in tents or between diarrheal and typhoidal attacks in the same individual this was found to be 10.4 days. The shortest period of incubation would appear to be slightly less than 8 days.

APPENDIX I.

THE SANITARY EXAMINATION OF SEVEN HUNDRED SAMPLES OF DRINKING WATER.

BY VICTOR C. VAUGHAN.

At the opening of the hygienic laboratory of Michigan University in October, 1888, I began a new method for the bacteriologic examination of drinking water, which, with various modifications, has been carried out since that time.

THE MICHIGAN METHOD.

The method may be briefly described as follows: The samples are collected in sterilized receptacles and sent to the laboratory without delay. Immediately on receipt, plates are made with 0.05 cc., 0.1 cc., 0.5 cc., and 1 cc. of the water. For many years only gelatin plates were prepared, and these were grown at room temperature. During the past two years, however, only agar plates are used, two sets being made, one of these grown at room temperature and the other at 38° C. The reason for this modification will be understood by those engaged in the bacteriologic study of drinking water. The toxicogenic bacteria of water have their optimum growth at 38° C., while many nontoxicogenic bacteria found in water have their optimum at the lower temperature. At the higher temperature the toxieogenic organisms crowd out the nontoxicogenic, while at the lower the reverse is true. The colonies developed on these plates are counted at the expiration of twenty-four, forty-eight, and seventy-two hours.

At the same time that the plates are made beef-tea tubes are inoculated with like amounts of the water, and these tubes are kept in the incubator for twenty-four hours at from 38° to 40° C. This temperature is regarded as a point of importance, and is never allowed to fall below 38° C., for the reason already given—that many harmless water germs do not multiply at all, or do so but feebly, at 38° C. So far as I know, this fact was first observed in this laboratory, and it has been practically applied ever since the opening of the institution in 1888. If no bacteria develop at this temperature the water is reported as perfectly safe. Certainly it can

cause no infectious disease when it contains no bacteria that will grow at the temperature of the human body. It matters not how many thousand it may show per cubic centimeter when grown at room temperature.

When germs are found in any of the tubes after twenty-four hours in the incubator, from 1 to 2 cc. of the beef-tea cultures is injected intra-abdominally into white rats or guinea pigs. Generally two animals are thus inoculated from each tube. If none of these animals die from the effects of these injections the water is regarded as safe. If one or more of the animals die agar plates are made immediately after death from the heart's blood. The thoracic cavity is opened, the heart exposed *in situ*, its surface seared with a hot iron, and the cavity punctured with a sterile glass pipette, into which a few drops of the blood is drawn. With the blood thus obtained the plates are made.

The purpose held in view in these animal experiments is to use the animal as a plate for separating the toxicogenic organisms from the nontoxicogenic. These agar plates are developed at 38° C., and the success of the method is largely dependent on the skill and care given to this part of the work. The colonies found on these plates are studied most carefully, and in the routine work five cultures are made from each kind of colony. By this I mean to say that if all the colonies appear to be the same cultures are made from at least five colonies, while if it is evident that there are two or more kinds of colonies present five cultures are made from each kind. It is true that this procedure takes considerable time and demands much labor, but it has been found that unless this procedure be carried out pure cultures are not obtained, and it is subsequently impracticable to differentiate the organisms. It not infrequently happens that when the colonies are apparently the same we succeed in obtaining two or more germs from them. We have tried for these plates various kinds of culture media, such as litmus-lactose agar, for the purpose of

repair, which will require several weeks. In the meantime the city and post are at present being supplied from a well dug in a river bed (the river beds in this country are dry several months in the year), which collects the waste of the greater portion of the town. This supply has, in my opinion, every opportunity for infection. Animal inoculations with germs obtained from this water have in my hands proved toxic, guinea pigs having died within twenty-four hours. We have not experimented with the Del Rio supply from want of animals. * * * The drinking water used in the garrison has been boiled since I discovered the character of its present supply. Typhoid fever has been endemic in the city of Prescott for years. Many persons having typhoid fever claim that they used no other water than that from the Del Rio supply.

The Del Rio water furnished us with the three germs described under 6, and the well water with the two germs described under 7. Guinea pigs inoculated with water No. 6 died within fourteen hours. By plating and replating from the heart's blood of these animals we obtained the organisms described under 6a, 6d, and 6e. We have studied these germs very carefully and it is possible that 6d and 6e are the same organism. They certainly belong to the same group and we have classified them as proteus germs. It will be observed, however, that while 6d is motile 6e is nonmotile, 6d produces indol while 6e does not; 6d coagulates milk more promptly than 6e. However, we do not lay a great deal of stress on this point, nor on the slightest differences seen in the potato cultures, except that 6d was colorless on potato while 6e was plainly yellowish pink. So far as gas production is concerned the two germs might be the same. Whatever the relation between 6d and 6e, both of these certainly differ from 6a. The latter does not liquefy, does not produce indol, does not coagulate milk, even after ninety-six hours, and does evolve a much larger amount of gas than either 6d or 6e; 6a, as will be seen from the table, we have classified as doubtful. This water would be condemned.

The differences between 7a and 7b are plainly seen. 7a is a nonliquefying while 7b is a liquefying organism. 7a produces no indol while 7b produces this substance in abundance. 7a neither coagulates nor produces acid in milk, 7b does both. 7a is a typical germ of the class, which in this laboratory we have designated under the head of venenosus. Its close resemblance to the typhoid bacillus is easily seen by a study of the table.

8a came from a spring which breaks from a hillside, the top of which is covered with houses, and there are many chances of pollution. This organism certainly belongs to the proteus group, and the water is not condemned.

14a and 14b were obtained from the heart's blood of animals inoculated from the public water supply of Petoskey, Mich. It will be seen that one of these does not liquefy gelatin, while the other does, and one produces no indol, while the other produces this substance. One coagulates milk more promptly than the other. So far as growths on potato and the evolution of gas are concerned, these organisms closely resemble each

other. 14a is classed as doubtful, and 14b as proteus. The water is condemned on account of the presence of 14a.

20a, 20b, and 20c were obtained from the heart's blood of animals inoculated with water from Battle Creek, Mich. 20c is quite typical of the group venenosus. 20b certainly belongs to the colon group, while 20a we have classed as doubtful. This water is condemned.

21a was from a test well sunk in searching for good water. The water was not condemned.

22a is what we have called *Bacillus venenosus brevis*. Under the microscope this short bacillus may easily be mistaken for a coccus, especially in stained specimens, but when examined in a hanging drop, it will be seen that it is a short motile bacillus. 22c is classed as doubtful.

9a came from a well near Ann Arbor, and was sent for examination because one man in the family using this water developed typhoid fever. It must be stated, however, that this man was several times away from home, and at least once, about two weeks before the development of the disease, spent twenty-four hours in a city where typhoid fever was prevalent.

10a and 10d are interesting. They were obtained from the heart's blood of the same animal. The water came from a well at a farmhouse in which there were two cases of typhoid fever, one of extreme severity and the other light in character. The only marked difference between 10a and 10d is that 10a produced acid in milk, while 10d did not. Neither coagulated milk.

11, 12, and 13 came from different samples of water. All these waters were sent from Petoskey. 11a came from a test well, while 12a and 13a came from the city supply. 11a was not condemned; 12a and 13a were condemned.

BRIEF DESCRIPTIONS OF THE BACTERIA DISCOVERED IN AND ISOLATED FROM THE WATERS EXAMINED.

No. 1. *Micrococcus candicans*.

Form: Large cocci often grouped in clusters, which vary much in size.

Growth:

On gelatin plates: Superficial colonies look like minute drops of milk. The deeper ones are more or less brown and granular.

In gelatin tubes: Grows along the line and forms a "nail head" on the surface.

On agar: A yellowish or brownish growth.

On potato: A white, slimy growth.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows at ordinary temperature, but not at 38° C.

Rate of growth: Rapid.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Negative.

Color: White.

Toxicogenic properties: Negative.

No. 2. Micrococcus aquatilis albus.

Form: Small cocci.

Growth:

On gelatine plates: Snow-white dots. Spherical colonies, with many irregular forms.

In gelatine tubes: Very slight along the line, and spreading but little over the surface. The growth on the gelatin is not abundant.

On agar: Very slight white growth.

On potato: Thick directly over the place of application, but spreading very little. The color is yellowish white.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows slowly at ordinary temperature, and more feebly at 38° C.

Rate of growth: Very slow.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Negative.

Color: White.

Toxicogenic properties: Negative.

No. 3. Micrococcus aquatilis magnus.

Form: Very large micrococci.

Growth:

On gelatine plates: Deep brown colonies, with smooth outline.

In gelatin tubes: Few isolated colonies along the track. Spreads over the surface.

On agar: White, thin growth.

On potato: White or brownish granular growth.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows well at ordinary temperature, and feebly at 38° C.

Rate of growth: Moderate.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Negative.

Color: White.

Toxicogenic properties: Negative.

No. 4. Micrococcus luteus.

Form: Small micrococci, growing in zooglea.

Growth:

On gelatin plates: Sulphur-yellow, granular colonies.

In gelatin tubes: Grows along the line and slowly spreads over the surface.

On agar: A lemon-yellow growth.

On potato: An abundant growth, which is at first dirty white, but which gradually becomes lemon-yellow.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows at ordinary temperature, but not at 38° C.

Rate of growth: Rapid.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Negative.

Color: Lemon-yellow.

Toxicogenic properties: Negative.

No. 5. Micrococcus cereus.

Form: Micrococci.

Growth:

On gelatin plates: Pale yellow colonies, of smooth outline.

In gelatin tubes: Very slight along the track; spreads slowly over the surface.

Growth—Continued.

On agar: Very faint white growth.

On potato: Yellowish white waxy growth. Beyond the border of the growth the potato becomes bluish gray.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows at ordinary temperature, but does not grow at 38° C.

Rate of growth: Slow.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Negative.

Color: White to brownish-yellow.

Toxicogenic properties: Negative.

No. 6. Micrococcus subflavus.

Form: Elliptical micrococci, growing in zooglea.

Growth:

On gelatin plates: Yellowish-brown, spherical colonies.

In gelatin tubes: Very slight along the track; spreads slowly over the surface.

On agar: White to yellowish white.

On potato: Pale-yellow growth, with sloping edges.

In Parietti's solution: Does grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows at ordinary temperature, and feebly at 38° C.

Rate of growth: Moderate.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Negative.

Color: Pale yellow.

Toxicogenic properties: Negative.

No. 7. Micrococcus aquatilis invisibilis.

Form: Oval cocci.

Growth:

On gelatin plates: Deep-brown colonies, with smooth outline; spreading irregularly superficially.

In gelatin tubes: Slight growth along the line, but spreading on the surface.

On agar: White, thin growth.

On potato: Invisible.

In Parietti's solution: Does grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows well at ordinary temperature, but feebly at 38° C.

Rate of growth: Slow.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Negative.

Color: White.

Toxicogenic properties: Negative.

No. 8. Diplococcus aquatilis.

Form: Diplococci.

Growth:

On gelatin plates: Smooth, pale yellow colonies, mostly spherical, but showing some irregularities.

On gelatin tubes: Growth confined to surface, where it spreads to the walls of the tube.

On agar: Smooth, white growth.

On potato: Dirty white and glazed; thick, with sloping borders.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Does not grow at 38° C.; grows well at ordinary temperature.

Rate of growth: Moderate.
 Relation to air: Aerobic.
 Production of gas: None.
 Liquefaction: None.
 Color: White.
 Toxicogenic properties: Negative.

No. 9. Streptococcus aquatilis.

Form: Large micrococci; some single, others in pairs, and some in chains of from four to eight.

Growth:

On gelatin plates: Colonies spherical, many having notched outlines.

In gelatin tubes: Grows very slightly along the line, but spreads over the surface to the walls of the tube.

On agar: Very thin, white growth.

On potato: Heavy, moist, white growth.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Does not grow at 38° C.; grows at ordinary temperature.

Rate of growth: Slow on gelatin; rapid on potato.

Relation to air: Aerobic.

Production of gas: None.

Liquefaction: Negative.

Color: White.

Toxicogenic properties: Negative.

No. 10. Bacillus fluorescens liquefaciens.^a

Form: Very small bacilli; twice as long as broad.

Growth:

On gelatin plates: Small, round colonies, liquefying and sinking into the gelatin.

In gelatin tubes: Liquefies gelatin rapidly from surface evenly to bottom; no seum on surface; deposit heavy and yellowish white. The supernatant fluid is yellowish, with green fluorescence, most marked near the surface.

On agar: Thin white growth.

On potato: Smooth growth, with yellowish tint and sloping margins.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows at ordinary temperature, but does not grow at 38° C.

Rate of growth: Rapid at ordinary temperature.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Liquefies rapidly and completely.

Color: Yellowish white.

Toxicogenic properties: Negative.

No. 11. Bacillus fluorescens nonliquefaciens.

Form: Small bacilli, with rounded ends.

Motility: Nonmotile.

Growth:

On gelatin plates: Glistening, mother-of-pearl colonies, spreading on the surface.

In gelatin tubes: Growth confined to surface and dirty yellow in color; subjacent gelatin shows green fluorescence.

^a I have found two varieties of this germ. The second differs from the one described in this table in the following particulars: 1. In gelatin tubes the liquefaction proceeds slowly, and after half or two-thirds of the gelatin has been liquefied ceases altogether, the subjacent gelatin showing marked fluorescence. 2. It grows abundantly in Uffelmann's gelatin and takes the stain more markedly than does Eberth's germ.

Growth—Continued.

On agar: White on the surface, while the mass of agar becomes green.

On potato: Grayish-white or brown growth, with glistening surface.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows well at ordinary temperature, but does not grow at 38° C.

Rate of growth: Rapid at ordinary temperature.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Nonliquefying.

Color: White or yellowish to brownish white.

Toxicogenic properties: Negative.

No. 12. Bacillus gasoformans.

Form: Small bacilli, two to three times as long as broad.

Motility: Motile.

Growth:

On gelatin plates: Large colonies, which rapidly liquefy the gelatin.

In gelatin tubes: Rapidly liquefies the gelatin, and bubbles of gas form along the line of inoculation.

On agar: A brownish or yellowish growth.

On potato: Dirty white growth.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows at ordinary temperature, but not at 38° C.

Rate of growth: Rapid.

Relation to air: Aerobic.

Production of gas: Produces gas abundantly.

Liquefaction: Liquefies gelatin rapidly.

Color: White.

Toxicogenic properties: Negative.

No. 13. Bacillus liquefaciens albus.

Form: Small rod, with rounded ends.

Motility: Very motile.

Growth:

On gelatin plates: Small, round colonies, liquefying rapidly.

In gelatin tubes: Grows rapidly and completely liquefies the gelatin.

On agar: A dirty white growth.

On potato: Yellowish or brownish white.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Does not grow at 38° C.; grows well at ordinary temperature.

Rate of growth: Moderate.

Relation to air: Aerobic.

Production of gas: The gelatin tubes give off no odor, and for this reason this germ must not be confounded with the bacillus liquefaciens as described by Eisenberg.

Liquefaction: Liquefies rapidly.

Color: White.

Toxicogenic properties: Negative.

No. 14. Bacillus albus.

Form: Short bacilli, often in chains.

Motility: Motile.

Growth:

On gelatin plates: White, smooth colonies.

In gelatin tubes: Grows slowly along the line of inoculation and forms a white "nail head" on the surface.

Growth—Continued.

On agar: A milk-white growth.

On potato: A dirty yellowish-white growth.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows at ordinary temperature, but does not grow at 38° C.

Rate of growth: Slow.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Does not liquefy.

Color: White.

Toxicogenic properties: Negative.

No. 15. Bacillus albus putridus.

Form: Long and short bacilli, often growing in chains.

Motility: Motile.

Growth:

On gelatin plates: Round, white, or brown colonies.

In gelatin tubes: Growth confined to surface, where it becomes very heavy. Liquefaction extends downward very slowly. (In these respects this germ differs from that described by Eisenberg under this name.) The contents of the tube give off a highly offensive odor.

On agar: Heavy, smooth growth.

On potato: Slimy, grayish-white; later, brownish growth.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Does not grow at 38° C.; grows well at ordinary temperature.

Rate of growth: Rapid.

Relation to air: Aerobic.

Production of gas: Gives off putrefactive odors.

Liquefaction: Liquefies slowly.

Color: White or yellowish white.

Toxicogenic properties: Negative.

No. 16. Bacillus violaceus.

Form: Bacilli, about three times as long as broad, often growing in threads.

Motility: Motile.

Growth:

On gelatin plates: The colonies look like small air bubbles to the unaided eye. Under the microscope the colonies are granular and violet. Sometimes the surface of the gelatin is raised like a foam.

In gelatin tubes: Produces a funnel-shaped liquefaction, while the pale, violet mass of germs lies at the bottom.

On agar: A blue to violet growth.

On potato: A dark violet growth.

In Parietti's solution: Not tested.

In Uffelmann's gelatin: Not tested.

Effect of temperature: Grows at ordinary temperature, but not at 38° C.

Rate of growth: Moderate.

Relation to air: Facultative anaerobic.

Production of gas: None observed.

Liquefaction: Liquefies.

Color: Produces a violet color.

Toxicogenic properties: Negative.

No. 17. Bacillus gracilis aerobiescens.

Form: Bacilli, four to six times as long as broad.

Motility: Motile.

Growth:

On gelatin plates: Small, yellow colonies of rapid growth.

In gelatin tubes: Grows abundantly along the track.

Growth—Continued.

On agar: Grayish-white, feeble growth.

On potato: A waxy growth of pinkish-white color, while beyond the growth the potato becomes steel gray.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Grows abundantly, and stains more intensely than does Eberth's germ.

Effect of temperature: Grows at ordinary temperature; does not grow at 38°.

Rate of growth: Rapid.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Negative.

Color: White to gray.

Toxicogenic properties: Negative.

No. 18. Bacillus gracilis anaerobiescens.

Form: Bacilli, three times as long as broad, often growing in long, slender rods.

Motility: Very motile.

Growth:

On gelatin plates: Brownish colonies, spreading irregularly.

In gelatin tubes: Grows abundantly along the line, and also spreads over the surface.

On agar: Thin, white growth.

On potato: Growth is yellowish white, abundant, and prominent. Stains made from potato show long threads, with shorter bacilli near, often presenting the appearance of fringe.

In Parietti's solution: Grows.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows well at ordinary temperature, and feebly at 38° C.

Rate of growth: Rapid.

Relation to air: Grows under gelatin.

Production of gas: Forms gas abundantly when grown under gelatin.

Liquefaction: Negative.

Color: White.

Toxicogenic properties: Negative.

No. 19. Bacillus helveticus.

Form: Short bacilli, often growing in chains, and frequently forming long threads.

Motility: Only an oscillation.

Growth:

On gelatin plates: Small, yellowish or brownish colonies.

In gelatin tubes: Forms on the surface a spreading white growth, which later becomes yellow. The growth spreads to the walls of the tube, and very slowly sinks in the gelatin as liquefaction goes on. The growth along the line is very slight, or wanting altogether.

On agar: Yellowish white growth.

On potato: Yellow.

In Parietti's solution: Does not grow.

In Uffelmann's gelatin: Does not grow.

Effect of temperature: Grows well at ordinary temperature, but only feebly at 38° C.

Rate of growth: Slow.

Relation to air: Aerobic.

Production of gas: None observed.

Liquefaction: Liquefies very slowly.

Color: White to yellow.

Toxicogenic properties: Negative.

No. 20. Bacillus rubidus.

Form: A bacillus four to six times as long as broad.

Motility: Sluggishly motile.

Growth:

On gelatin plates: Yellowish, irregular colonies.
 In gelatin tubes: Slight growth of isolated colonies along the line; these soon become pink in color. The growth at the surface is abundant, and as the gelatin liquefies large masses of the germ, with faint pink tint along the lower border, float in the liquid.
 On agar: Faint yellowish growth, with no evidence of the possible development of color shown on some other media.
 On potato: The growth has at first a slight pinkish tint, which, with age, develops into a beautiful red.
 In Parietti's solution: Does not grow.
 In Uffelmann's gelatin: Does not grow.
 Effect of temperature: Grows well at ordinary temperature, but does not grow at 38° C.
 Rate of growth: Moderate.
 Relation to air: Aerobic.
 Production of gas: None observed.
 Liquefaction: Liquefies slowly.
 Color: Red.
 Toxicogenic properties: Negative.

No. 21. Bacillus cinnabareus.

Form: A short bacillus.

Motility: Highly motile.

Growth:

On gelatin plates: Brick-red colonies.
 In gelatin tubes: Liquefies rapidly and completely.
 On agar: Cinnabar-red growth.
 On potato: An abundant growth, at first yellowish-white, becoming more red with age.
 In Parietti's solution: Not tested.
 In Uffelmann's gelatin: Does not grow.
 Effect of temperature: Grows at ordinary temperature; does not grow at 38° C.
 Rate of growth: Rapid.
 Relation to air: Not tested.
 Production of gas: None observed.
 Liquefaction: Liquefies rapidly.
 Color: Cinnabar-red.
 Toxicogenic properties: Negative.

No. 22. Bacillus subflavus.

Form: Bacilli, two to three times as long as broad.

Motility: Motile.

Growth:

On gelatin plates: Small, glistening, white, irregular colonies.
 On gelatin tubes: Grows but slightly along the track; spreads over the surface. The tube shows slight fluorescence.
 On agar: Yellowish-white growth; with age the mass of agar becomes brownish yellow.
 On potato: A beautiful salmon-colored granular growth.
 In Parietti's solution: Does not grow.
 In Uffelmann's gelatin: Grows abundantly, and stains more intensely than Eberth's germ.
 Effect of temperature: Grows at ordinary temperature; does not grow at 38° C.
 Rate of growth: Rapid.
 Relation to air: Aerobic.
 Production of gas: None observed.
 Liquefaction: Negative.
 Color: Yellowish white.
 Toxicogenic properties: Negative.

No. 23. Bacillus ochraceus.

Form: Bacilli, two to three times as long as broad, with rounded ends.

Motility: Nonmotile (in which respect it differs from Zimmermann's germ of the same name).

Growth:

On gelatin plates: Small, yellow, irregular colonies, spreading slightly over the surface.
 In gelatin tubes: Slowly liquefies evenly from the surface, the mass of germ lying on the bottom of the liquefied part and showing at first a pale-yellow, then an orange growth.
 On agar: Forms an even yellow growth.
 On potato: A beautiful and abundant growth of ocher yellow. This growth is very thick and heavy, and in this respect differs from the germ of Zimmermann.
 In Parietti's solution: Does not grow.
 In Uffelmann's gelatin: Does not grow.
 Effect of temperature: Does not grow at 38°; grows well at ordinary temperature.
 Rate of growth: Moderate.
 Relation to air: Aerobic.
 Production of gas: None.
 Liquefaction: Liquefies slowly.
 Color: Orange to ocher.
 Toxicogenic properties: Negative.

No. 24. Bacillus figurans.

Form: Bacilli, two to three times as long as broad, but showing marked variation in form. Sometimes they appear as very short bacilli, while at other times they grow into long threads.

Motility: Sluggishly motile.

Growth:

On gelatin plates: The deep colonies are spherical and smooth, but the superficial growth forms curved and interlacing lines, often presenting most grotesque figures. Plates may show no liquefaction after some days.
 In gelatin tubes: Does not develop along the line. Generally liquefies from the surface before the growth has reached the walls of the tube. Liquefaction, however, goes on very slowly, and in some instances the fluid is lost by evaporation as fast as it liquefies, and consequently there is apparently no liquefaction. After the gelatin has been liquefied halfway down the tube, the mass of germs subsides, and further liquefaction is very slow or does not occur at all.
 On agar: Forms a thin white growth, with heavy deposit often in water of condensation.
 On potato: Abundant, faintly yellow, mucilaginous growth, without raised edges.
 In Parietti's solution: Does not grow.
 In Uffelmann's gelatin: Does not grow.
 Effect of temperature: Grows well at ordinary temperature; feebly at 38° C.
 Rate of growth: Very rapid at ordinary temperature.
 Production of gas: None observed.
 Liquefaction: Liquefies halfway down the tube.
 Color: White.
 Toxicogenic properties: Negative.

No. 25. Micrococcus aquatilis.

Form: Small cocci, often in groups.

Growth:

On gelatin plates: Small, round, white colonies.
 In gelatin tubes: Very feeble growth along the line, but spreading over the surface.
 On agar: White, thin growth.
 On potato: Brownish, moist growth.
 In Parietti's solution: Grows.
 In Uffelmann's gelatin: Does not grow.
 Effect of temperature: Grows at ordinary temperature, also at 38° C.
 Rate of growth: Slow.
 Relation to air: Aerobic.
 Production of gas: None observed.

Liquefaction: Negative.
 Color: White.
 Toxicogenic properties: Negative.

No. 26. Bacillus albus anaerobiscens.

Form: Bacilli, two to three times as long as broad.
 Motility: Only an oscillation.
 Growth:

On gelatin plates: Smooth, spherical, yellowish or brownish colonies.
 In gelatin tubes: Grows well along the track and spreads over the surface.
 On agar: Heavy milk-white growth.
 On potato: Yellowish-white glistening growth.
 In Parietti's solution: Grows.
 In Uffelmann's gelatin: Grows and stains with the same intensity as Eberth's germ.

Effect of temperature: Grows at ordinary temperature and also at 38° C.

Rate of growth: Rapid.
 Relation to air: Grows under gelatin.
 Production of gas: None observed.
 Liquefaction: Does not liquefy.
 Color: White.
 Toxicogenic properties: Negative.

No. 27. Bacillus invisibilis.

Form: Large bacilli, from two to five times as long as broad, with rounded ends.
 Motility: Motile.
 Growth:

On gelatin plates: Pale yellow burr-like colonies, with irregular outline, and spreading slightly.
 In gelatin tubes: Grows abundantly along the track and spreads slowly over the surface.
 On agar: Thick white growth, with but little tendency to spread.
 On potato: Invisible growth.
 In Parietti's solution: Grows.
 In Uffelmann's gelatin: Grows abundantly, but does not take up the stain.

Effect of temperature: Grows at ordinary temperature and at 38° C.
 Rate of growth: Rapid.
 Relation to air: Grows under gelatin.
 Production of gas: None observed.
 Liquefaction: Does not liquefy.
 Color: White.
 Toxicogenic properties: Negative.

No. 28. Bacillus venenosus.

Form: A bacillus, from two to four times as long as broad, with rounded ends.
 Motility: Very motile.
 Growth:

On gelatin plates: Small, white dots spherical, and sometimes slightly yellow. The superficial colonies are raised above the surface of the gelatin.
 In gelatin tubes: Grows abundantly along the line, and slowly spreads over the surface. When taken from the spleen of an animal which has died twelve days or later after inoculation the tendency to spread over the surface of the gelatin is less marked than with the germ which has not passed through the animal body.
 On agar: A thin white growth.
 On potato: A light brown, moist growth. When the germ is taken from the spleen of an inoculated animal the growth is often invisible.

Growth—Continued.

In Parietti's solution: Grows abundantly.

In Uffelmann's gelatin: Grows abundantly, and the superficial colonies stain intensely, while the deeper ones are not so markedly stained as those of the Eberth germ.

Effect of temperature: Grows rapidly both at ordinary temperature and at 38° C.

Rate of growth: Rapid.

Relation to air: Grows well under gelatin.

Production of gas: Does not ferment glucose or lactose.

Liquefaction: Does not liquefy.

Color: White.

Indol: Negative.

Coagulation of milk: Negative.

Toxicogenic properties: Toxicogenic in rats, mice, guinea pigs, and rabbits.

No. 29. Bacillus venenosus brevis.

Form: A thick, short bacillus; length about twice the width; grows in threads in old cultures.

Motility: Motile.

Growth:

On gelatin plates: Small round colonies, with concentric rings. Generally, the deeper colonies are yellowish or brown. The surface colonies are raised and spread but little. On plates made from the spleen of an inoculated animal the colonies are less regular in outline, and show a marked tendency to spread over the surface.

In gelatin tubes: Grows well along the line and spreads slowly over the surface, but finally extends to the sides of the tube.

On agar: Thin, white growth.

On potato: Moist, light brown, thick growth. Cultures which have been kept for fourteen days or longer at 40° C form an invisible growth on potato. The medium used in these experiments was fresh spleen from man.

In Parietti's solution: Grows abundantly.

In Uffelmann's gelatin: Grows slowly, and takes the stain less markedly than does Eberth's germ.

Effect of temperature: Grows both at ordinary temperature and at 38° C.

Rate of growth: Rapid.

Relation to air: Grows well under gelatin.

Production of gas: Does not ferment glucose or lactose.

Liquefaction: Does not liquefy.

Color: White.

Indol: Negative.

Coagulation: Negative, or slight and tardy.

Toxicogenic properties: Toxicogenic in rats, mice, guinea pigs, and rabbits.

No. 30. Bacillus venenosus invisibilis.

Form: A slender bacillus; length, from two to four times the breadth. Ends are rounded.

Motility: Motile.

Growth:

On gelatin plates: Colonies are small, yellowish, and granular. Surface colonies are very irregular in shape and size, and are coarsely granular.

In gelatin tubes: Grows very slowly, both along the line and at the surface; scarcely visible after three days.

On agar: A very thin white growth.

On potato: On some potatoes the growth is invisible; on others there is a light brown growth.

In Parietti's solution: Grows well.

In Uffelmann's gelatin: Grows well and stains.

Effect of temperature: Grows at ordinary temperature and at 38° C.

Rate of growth: Slow.

Production of gas: Does not ferment glucose or lactose.

Liquefaction: Does not liquefy.

Color: White.

Indol: Negative.

Coagulation of milk: Negative.

Toxicogenic properties: Toxicogenic, but in less degree than *Bacillus venenosus*.

No. 31. Bacillus venenosus liquefaciens. (Proteus group.)

Form: A bacillus, whose length is from one and one-half to two times its breadth, and which has rounded ends.

Motility: Motile.

Growth:

On gelatin plates: The superficial colonies are raised, and spread over the surface. The deep colonies are yellowish and finely granular, with unbroken outline.

In gelatin tubes: Grows along the line abundantly, and spreads over the surface slowly. Liquefaction begins after from four to six weeks.

On sugar: A thin white growth.

On potato: A moist, light brown or yellowish growth.

In Parietti's solution: Grows abundantly.

In Uffelmann's gelatin: Grows abundantly and stains deeply.

Effect of temperature: Grows at ordinary temperature and at 38° C.

Rate of growth: Rapid.

Relation to air: Grows under gelatin.

Production of gas: Most strains, not all, ferment glucose; some ferment saccharose and lactose, others do not.

Liquefaction: Liquefies gelatin after some weeks.

Color: White.

Indol: Positive with most strains; negative with a few.

Coagulation of milk: Variable.

Toxicogenic properties: Toxicogenic in mice, rats, guinea pigs, and rabbits.

No. 32. Bacillus coli communis.

Form: A cocco bacillus, but showing considerable variation in different strains.

Motility: The typical colon bacillus found in water is nonmotile, but there are strains possessed of more or less motility.

Growth:

On gelatin plates: Superficial colonies are flat, more or less spreading, and varying in color from dull white to brown; borders are generally irregular. The deep colonies are round or oval, sometimes lobulated. The center is generally granular, while the border is more homogeneous.

In gelatin tubes: Grows abundantly along the line and spreads over the surface in a white, waxy growth, with waxy border.

Growth—Continued.

On agar: An abundant white or brownish growth.

On potato: An abundant, moist, brownish growth.

In Parietti's solution: Grows abundantly.

In Uffelmann's gelatin: Grows, but varies greatly in the readiness with which it takes up the stain.

Effect of temperature: Grows at ordinary temperature and at 38° C., but the latter is the optimum.

Rate of growth: Rapid, especially at 38° C.

Production of gas: Ferments glucose and lactose. Milk: Coagulates within from twenty-four to forty-eight hours.

Indol: Positive.

Liquefaction: Negative.

Toxicogenic properties: Toxicogenic to laboratory animals.

In the writer's opinion, waters containing Nos. 28, 29, or 30 should be condemned. The presence of No. 31 alone is not sufficient to condemn a water. A typical colon germ may be present without harm, but there are frequently found doubtful organisms, as is illustrated by the short table, page 678.

The results of the examination of 700 waters are given in the following table. The waters are divided into three classes. The first contains those which are supposed to be causing typhoid fever at the time the water is sent or to have caused the disease prevailing at the time. In other words, the water has been sent on account of the present existence of typhoid fever among those using it. In the second class are those waters which are not supposed to be causing typhoid fever at the time, but which are suspicious on account of insanitary surroundings or on account of previous sickness among those drinking it. In the third class are given those waters which have not been suspected of causing sickness and the sanitary surroundings of which are not said to be especially bad. Several of the third class have been sent for analysis in view of their possible selection for the water supply of cities and villages. The figures given in the chemical part of the table represent parts per million, the chlorine being calculated as sodium chloride. The number of germs in one-twentieth cc. is given, and consequently these figures should be multiplied by 20 in order to get the number per cc. as these figures are usually given.

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, from 1888 to 1904.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₄ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
1	Omaha, Nebr.	Well	2	0.168	0.118	129.0	+	—	50	—	—	+	B. liquefaciens albus was found in all the samples. B. fluorescens liquefaciens in No. 4. Micrococcus candidans in Nos. 1, 3, and 4. B. fluorescens nonliquefaciens and B. gasiformans in Nos. 5, 7, 8, 9, and 10. Other germs undetermined were found in Nos. 2 and 4. It will be noted that the chlorine content of all of these waters, especially of No. 1, is unusually high. Free ammonia is high in Nos. 1, 3, 4, and 8. Albuminoid ammonia is especially high in No. 3. These are interesting examples of highly polluted water, such as is frequently found in densely populated districts, but inasmuch as they contain no specific infection their use did not cause disease.
2	do	do	2	.050	.124	97.0	+	—	46	—	—	+	
3	do	do	2	.664	.230	12.0	+	—	120	—	—	+	
4	do	do	2	.162	.116	45.0	+	—	50	—	—	+	
5	do	do	2	.094	.112	23.0	+	—	26	—	—	+	
6	do	do	2	.028	.090	34.0	+	—	18	—	—	+	
7	do	do	2	.022	.102	48.0	+	—	38	—	—	+	
8	do	do	2	.172	.388	48.0	+	—	36	—	—	+	
9	do	do	2	.054	.068	98.0	+	—	20	—	—	+	
10	do	do	2	.032	.096	8.0	+	—	8	—	—	+	
11	Coldwater, Mich.	do	2	.270	.045	8.0	+	—	500	—	—	+	Nos. 11 and 13 contain large amounts of free ammonia. These were shallow wells and evidently polluted from privy vaults and cesspools. All samples contained B. liquefaciens albus, B. fluorescens liquefaciens, and B. violaceus.
12	do	do	2	.015	.025	14.0	+	—	712	—	—	+	
13	do	do	2	.270	.040	15.0	+	—	370	—	—	+	
14	do	do	2	.025	.040	12.0	+	—	580	—	—	+	

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
15	Ida, Mich	Well	2	0.910	0.120	155.0	+ ⁵	+ ²	2,000	—	—	+	B. liquefaciens albus was the only germ found.
16	Brown City, Mich.	do	2	.220	.096	8.0	+ ⁴	+ ⁴	400	—	—	+	B. fluorescens liquefaciens and B. liquefaciens albus.
17	Kalamazoo, Mich	do	3	.041	.084	7.0	+ ¹⁰	+ ²	63	—	—	+	B. fluorescens liquefaciens and B. liquefaciens albus found in both waters.
18	do	do	3	.020	.066	7.0	+ ¹⁰	+ ²	60	—	—	+	B. fluorescens liquefaciens and B. liquefaciens albus.
19	Mount Pleasant, Mich.	River	2	.094	.208	79.0	+ ⁴	+ ⁴	3,000	—	—	+	M. candidans, B. fluorescens liquefaciens, B. fluorescens nonliquefaciens, B. gasiformans, B. liquefaciens albus, and B. violaceus.
20	Gambier, Ohio	Well	2	.065	.062	240.0	+ ⁶	+ ⁴	683	—	—	+	B. liquefaciens albus.
21	Allegan, Mich	do	2	.206	.148	33.0	+ ⁴	+ ²	300	—	—	+	B. liquefaciens albus was the only organism found in these waters.
22	Three Rivers, Mich.	do	3	.070	.046	9.0	+ ⁴	+ ²	25	—	—	+	B. liquefaciens albus found in both of these samples.
23	do	do	3	.108	.072	7.0	+ ⁴	+ ²	20	—	—	+	B. liquefaciens albus.
24	do	do	3	.024	.054	7.0	+ ²	—	22	—	—	+	B. liquefaciens albus and B. fluorescens liquefaciens.
25	Allegan, Mich.	Hydrant	3	.220	.066	31.0	+ ⁴	+ ²	40	—	—	+	B. liquefaciens albus.
26	do	do	3	.272	.556	32.0	+ ⁴	+ ²	25	—	—	+	B. liquefaciens albus.
27	Coldwater, Mich	Well	3	.024	.038	14.0	—	—	16	—	—	+	B. liquefaciens albus.
28	Kalamazoo, Mich	do	3	.144	.058	9.0	—	—	280	—	—	+	B. liquefaciens albus and B. fluorescens liquefaciens.
29	Tecumseh, Mich.	do	2	.037	.078	10.0	+ ¹	—	40	—	—	+	B. liquefaciens albus.
30	Ishpeming, Mich.	Lake	3	.222	.418	6.0	+ ¹	+ ²	455	—	—	+	B. fluorescens liquefaciens, B. liquefaciens albus found in all three samples.
31	do	do	3	.036	.222	2.0	+ ¹	+ ²	50	—	—	+	B. liquefaciens albus.
32	do	do	3	.038	.208	3.0	+ ¹	+ ²	48	—	—	+	B. liquefaciens albus.
33	Three Rivers, Mich	Well	3	.200	.036	.9	—	+ ¹	25	—	—	+	B. liquefaciens albus found in these three samples.
34	do	do	3	.060	.102	.7	+ ¹	—	25	—	—	+	B. liquefaciens albus.
35	do	do	3	.016	.062	1.0	+ ¹	—	22	—	—	+	Both samples contained B. fluorescens liquefaciens, B. gasiformans, B. liquefaciens albus, and B. violaceus, and No. 36 contained in addition to these B. rubidus.
36	St. Louis, Mich	River	3	.060	.210	23.0	—	—	8,400	—	—	+	B. fluorescens liquefaciens, and B. liquefaciens albus.
37	do	do	3	.044	.320	24.0	—	—	1,008	—	—	+	The toxicogenic germ obtained from No. 39 did not liquefy gelatin nor give the indol test. Both waters contained B. liquefaciens albus. No. 39 was condemned; No. 40 was not.
38	Climax, Mich	Well	2	.206	.084	4.5	+ ¹	+ ¹	105	—	—	+	B. venenosus brevis, and Proteus vulgaris.
39	Grand Rapids, Mich.	River	1	.030	.134	10.0	+ ¹	+ ⁵	36,000	+	+	+	Nos. 42, 43, 44, and 45 contained B. fluorescens liquefaciens, and B. venenosus invisibilis. No. 46 contained M. candidans and B. fluorescens liquefaciens.
40	do	Spring	3	.024	.075	6.0	+ ⁵	—	120	—	—	+	No. 47 contained only B. liquefaciens albus, while No. 48 contained in addition B. fluorescens liquefaciens and M. candidans.
41	Ann Arbor, Mich.	Cistern	1	2.223	.908	3.0	+ ⁵	+ ¹	3,000	+	+	+	Proteus vulgaris was the only germ found in this water. The large amount of salt is due to the location and depth of the well.
42	Negaunee, Mich.	Lake Teal	1	.228	.368	30.0	+ ¹	+ ²	920	+	+	+	B. liquefaciens albus only was found. This is an example of a highly polluted but safe water.
43	do	do	1	.232	.460	30.0	+ ¹	+ ²	1,240	+	+	+	B. venenosus liquefaciens and B. liquefaciens albus, were found in all these waters. It is probable that if present methods of plating and replating had been used, B. venenosus would have been found in all of these samples. There was at this time a severe epidemic of typhoid fever at Iron Mountain, and the wells were undoubtedly specifically contaminated.
44	do	do	1	.296	.448	40.0	+ ¹	+ ²	772	+	+	+	These were all shallow wells situated upon a hillside, and the contamination came from an imported case of typhoid fever, whose discharges were thrown on the ground on the hill above these wells, and undoubtedly were washed into the wells.
45	do	Mine	1	.312	.236	140.0	+ ¹	+ ²	2,060	+	+	+	B. venenosus brevis and B. liquefaciens albus. There were two cases of typhoid fever in the family using this water. The cistern was contaminated from a leak in the slop hopper.
46	do	Sand shaft	3	.042	.120	40.0	+ ¹	+ ²	772	+	+	+	B. venenosus liquefaciens and B. liquefaciens albus. Again it is probable that with improved methods B. venenosus might have been obtained from this water. It was a farm well, and there were cases of typhoid fever among persons who for months had not been away from the farm.
47	Mendon, Mich	Well	2	.019	.048	4.0	+ ¹	—	25	—	—	+	B. liquefaciens albus and B. fluorescens liquefaciens.
48	do	do	2	.020	.210	34.0	+ ²	+ ¹	100	—	—	+	B. albus was the only organism that could be found in this water. There were three cases of typhoid in the family using it.
49	Deerfield, Mich.	do	1	.508	.158	695.0	—	—	898	+	+	+	No. 62 contained B. liquefaciens albus and B. venenosus invisibilis. Nos. 63 and 64 contained only B. liquefaciens albus. No. 65 contained in addition to B. liquefaciens albus, B. venenosus brevis. It is interesting to note the small number of germs in 65. This water was from a well, immediately above which, on the side of a hill, was a very filthy privy vault. There had been no cases of typhoid fever among those using this water, but it was suspected on account of the relative location of the well and privy vault.
50	Northville, Mich	do	2	1.136	.732	6.7	+ ⁵	—	1,550	—	—	+	B. liquefaciens albus.
51	Iron Mountain, Mich.	do	1	1.256	1.920	44.0	+ ¹⁰	+ ²	1,500	+	+	+	B. liquefaciens albus, M. candidans, B. albus putridus. This water had a bad odor, but the people who drank it exclusively escaped typhoid, while those who drank the well waters Nos. 51 and 56 developed this disease.
52	do	do	1	.384	.840	20.0	+ ¹	+ ¹	1,350	+	+	+	B. liquefaciens albus.
53	do	do	1	.784	.960	52.0	+ ¹⁰	+ ¹⁰	1,260	+	+	+	These four waters were taken at different times from a cold spring flowing in large volume. It will be observed that two of these samples contained no germs.
54	do	do	1	.904	1.360	16.0	—	+ ¹	1,700	+	+	+	B. liquefaciens albus and B. fluorescens liquefaciens.
55	do	do	1	.456	.914	12.0	—	+ ¹	850	+	+	+	In Nos. 75 and 76 B. albus only was found. In No. 77 B. fluorescens liquefaciens only.
56	do	do	1	.464	1.256	28.0	—	+ ¹	950	+	+	+	
57	Ann Arbor, Mich.	Cistern	1	.318	.262	6.0	+ ⁶	+ ⁴	1,200	+	+	+	
58	do	do	1	.492	.504	9.0	+ ⁴	+ ⁵	1,770	+	+	+	
59	Rankin, Ill.	Well	1	.512	.332	24.0	+ ¹	+ ¹	738	+	+	+	
60	Pomfret, Conn.	do	2	.104	.116	4.0	+ ¹	+ ¹	151	—	—	+	
61	Sherwood, Mich.	do	1	.194	1.160	7	0	+ ¹	4,116	—	—	+	
62	Soudan, Minn.	Lake	3	.144	.488	3	+ ¹	+ ¹	428	+	+	+	
63	do	do	3	.132	.488	4	+ ²	+ ²	459	—	—	+	
64	do	Well	2	.120	.090	2	+ ²	+ ¹	28	—	—	+	
65	do	do	2	.072	.124	2	—	—	4	+	+	+	
66	Lake City, Mich.	Lake	3	.154	.280	3	—	+ ¹	124	—	—	+	
67	Iron Mountain, Mich.	do	3	.260	.270	4.5	+ ¹	—	9	—	—	+	
68	Ironwood, Mich.	Well	3	.176	.248	9.9	—	—	12	—	—	+	
69	Ann Arbor, Mich.	Spring	3	.012	.016	2.5	—	—	0	—	—	+	
70	do	do	3	.044	.120	4	—	—	0	—	—	+	
71	do	do	3	.050	.080	6	—	—	0	—	—	+	
72	do	do	3	.090	.214	4	—	—	6	—	—	+	
73	Leslie, Mich.	Well	2	.536	.840	14	—	—	101	—	—	+	
74	do	do	2	1.144	.984	12.5	—	—	2,940	—	—	+	
75	Ann Arbor, Mich.	do	3	.064	.064	17	+ ²	+ ¹	150	—	—	+	
76	do	do	3	.068	.070	6	+ ²	+ ¹	60	—	—	+	
77	do	Spring	3	.124	.194	3.5	+ ⁴	+ ²	295	—	—	+	

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
78	Three Rivers, Mich.	Well.....	3	0.015	0.019	6.288	—	+1	8	—	—	+	Doctor Aspinwall, who sent this water, wrote as follows: "The well is 118 feet in depth, the last 9 feet penetrating the gravel. I might add that the river flows within about 150 or 200 feet of the well. Perhaps some 100 feet distant and 8 or 10 feet above is situated the dam of the Rocky River. Water flows from this well at the rate of from 25 to 50 gallons per minute."
79	East Lake, Mich.do.....	3	.067	.058	41.74	+2	—	0	—	—	—	H. W. Carey, the sender, wrote as follows: "The village of East Lake is situated on a bluff about 80 feet above the level of the Manistee Lake, and this water came from a well about 30 feet deep, situated at the base of the bluff."
80	Gladwin, Mich.do.....	3	.374	.044	11.8	+4	+1	63	—	—	—	B. liquefaciens albus and B. albus.
81	Alpena, Mich.	Hydrant.....	3	.148	.370	6.60	—	—	22	—	—	+	B. liquefaciens albus and B. fluorescens liquefaciens.
82	.....do.....	Spring.....	3	.072	.174	4.64	—	—	2,880	—	—	+
83	Soudan, Minn.	Well.....	3	.050	.156	1.81	+9	+4	6	—	—	+	No. 83 contained B. albus. No. 84 B. fluorescens liquefaciens and B. liquefaciens albus. It is probable that the small number of germs in Nos. 83 and 84 and their absence in No. 85 is due to their dying out in the water from the time it was collected until it reached the laboratory. The large number of nitrates and nitrites in these waters indicate that they had contained a large number of germs.
84	.....do.....	.....do.....	3	.058	.132	2.14	+10	+2	3	—	—	+
85	.....do.....	.....do.....	3	.076	.140	2.14	+10	+4	0	—	—	+
86	Gladwin, Mich.	Artesian well...	3	.260	.102	1.32	—	+2	10	+	+	+	The nature of the toxicogenic germ was not determined. It probably came from imperfect sterilization of the receptacle.
87	Imlay City, Mich.do.....	3	.520	.052	1.321	—	—	98	+	+	+	Same as above; also B. liquefaciens albus and B. fluorescens liquefaciens.
88	Gladwin, Mich.do.....	3	B. venenosus.
89	Imlay City, Mich.	.....do.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
90	Sault Ste. Marie, Mich.	Lake.....	1	.224	.168	3.30	+1	+2	2,000	+	+	+	
91	Bay City, Mich.	Hydrant.....	3	.340	.480	425.70	—	—	450	+	+	+	Both waters were drawn from the same hydrant—one Sept. 28, 1890, and the other on Oct. 6, 1890. The first sample was allowed to stand until the second was collected, when both were sent. The toxicogenic germ in No. 92 belongs to the proteus group. B. fluorescens liquefaciens found in both. It is probable that the toxicogenic germ in No. 92 had been killed in No. 91 by the more hardy fluorescing bacillus.
92	.....do.....	.....do.....	3	.000	.680	465.30	—	—	450	+	+	+
93	Wyandotte, Mich.	Well.....	1	.400	.560	264.4	13.6	+2	2,400	+	+	+	No. 93 was from the well of a milkman whose route could be traced by cases of typhoid fever. B. venenosus found. The same germ was found in the milk. Toxicogenic germ in No. 94 belongs to proteus group. These waters were sent on account of an epidemic of typhoid among the employees in a sawmill which was located on the bank of the lake. The well from which No. 97 was taken is located immediately on the bank of the lake. The well from which No. 96 was taken was more than a quarter of a mile distant from the mill and was at the house where the men ate. The cook and others who drank exclusively from this well were not sick. B. venenosus in Nos. 95 and 97.
94	.....do.....	River.....	1	.008	.520	49.5	+6	+1	1,770	+	+	+
95	Torch Lake, Mich.	Lake.....	1	.....	.....	.....	.....	.....	5,284	+	+	+
96do.....	Well.....	1	2,520	—	—	—	B. liquefaciens albus and B. fluorescens liquefaciens in No. 98. In Nos. 99 and 100 B. fluorescens liquefaciens.
97	.....do.....	.....do.....	1	.....	.....	.....	.....	.....	20	+	+	+
98	Pontiac, Mich.	Hydrant.....	2	.422	.574	9.9	+1	—	23	—	—	+	B. fluorescens liquefaciens.
99	.....do.....	Lake.....	2	.266	.302	9.75	—	+10	18	—	—	+
100do.....do.....	2	.130	.350	9.90	—	—	12	—	—	+	Do.
101	Negaunee, Mich.	.....do.....	1	.024	.820	6.605	—	+2	10	—	—	+
102	Parma, Mich.	Well.....	1	.058	.124	100.65	+8	+1	1,234	—	—	+	Nos. 103 and 104 M. luteus, and No. 105 also B. fluorescens liquefaciens.
103	Sault Ste. Marie, Mich.	River.....	2	.150	.104	6.60	+1	—	5	—	—	+	
104do.....do.....	2	.060	.012	8.250	+8	+1	12	—	—	+	B. fluorescens liquefaciens.
105	.....do.....	.....do.....	2	.176	.160	11.55	—	+1	150	—	—	+
106	Bay City, Mich.	Hydrant.....	3	.366	.380	339.95	+5	—	350	—	—	+	B. liquefaciens albus.
107	Pontiac, Mich.	Well.....	1	.198	.368	44.55	—	—	240	—	—	+	
108	Three Rivers, Mich.do.....	3	.472	.212	9.900	—	+1	26	—	—	+	There were at this time numerous scattered cases of typhoid at St. Johns. The city water, taken from a well, was evidently polluted by near-by privy vaults. No. 110 was from a well near the top of a hill and more than a quarter of a mile from the well from which the city water was pumped.
109	St. Johns, Mich.	.....do.....	1	.094	.130	18.15	—	+1	11,025	+	+	+
110	.....do.....	.....do.....	1	.130	.122	18.15	—	+1	6	—	—	+
111	Duluth, Minn.	Lake.....	1	.130	.122	18.15	—	+1	6	—	—	+	These samples came in January, 1891, at the time of the prevalence of a very severe epidemic of typhoid. The one in which a toxicogenic germ was found was taken from a tap in a doctor's office, the occupant of which had gone home some two weeks before with typhoid fever, and, so far as known, the tap had not been used since that time. B. venenosus invisibilis found in this water. It is interesting to remark that another bacteriologist, depending wholly upon the number of germs, made several examinations of the Duluth water during the epidemic and pronounced it perfectly wholesome.
112	.....do.....	.....do.....	1	.058	.012	8.25	+2	+1	198	—	—	+
113	.....do.....	.....do.....	1	.007	.264	8.25	+1	+1	20	+	+	+
114	.....do.....	.....do.....	1	.038	.580	9.75	+1	+1	1	—	—	+
115	.....do.....	Spring.....	3	.058	.070	14.85	1.427	+1	12	—	—	+
116	Leadville, Colo.	Mine.....	3	.094	.094	3.30	+1	—	145	—	—	+	This water contained a distinct trace of lead. M. luteus and B. fluorescens liquefaciens.
117	Iron Mountain, Mich.	Well.....	3	.444	.444	4.95	—	+1	5	—	—	+	B. fluorescens liquefaciens in all these waters.
118	.....do.....	Hydrant.....	3	.570	.570	4.95	+1	+2	6	—	—	+
119	.....do.....	Lake.....	3	.342	.342	4.125	+1	+4	2	—	—	+
120	.....do.....	.....do.....	2	.110	.322	6.930	—	+1	5	—	—	+
121	.....do.....	.....do.....	2	.092	.314	7.090	—	+1	4	—	—	+
122	Gaylord, Mich.	Unknown.....	3	.390	.098	26.40	—	—	670	—	—	+	B. liquefaciens albus.
123	Iron Mountain, Mich.	.....do.....	2	.003	.150	4.0	—	—	8	—	—	+
124	Norway, Mich.do.....	3	.110	.030	1.0	—	—	6	—	—	+	Do.
125	.....do.....	.....do.....	3	.020	.150	3.0	—	—	10	—	—	+
126	.....do.....	Well.....	3	.005	.010	.50	—	—	6	—	—	+
127	Adrian, Mich.do.....	1	.030	.200	10.0	+1	+1	40	+	+	+	This water was from a well supplying the Raisin Valley Seminary. A number of the students had typhoid at the time. Investigation showed that the well was contaminated by overflow from a cesspool. B. venenosus found; also B. cinnabareus.
128	Iron Mountain, Mich.	Lake.....	3	.005	.025	2.0	—	—	13	—	—	+	

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Supraphytic.	Remarks.
129	Pontiac, Mich.	Well	3	.0180	.0100	12.0	—	—	30	—	—	+	B. albus.
130	Ironwood, Mich.	River	2	.103	.116	5.6	—	—	400	—	—	+	B. gasiformans, B. liquefaciens albus, and B. fluorescens liquefaciens.
131	Iron Mountain, Mich.	Spring	3	.070	.500	.420	—	+	4	—	—	+	M. aquatilis, B. albus anaerobescens, and B. fluorescens liquefaciens.
132	Ithaca, Mich.	Unknown	3	.410	.160	25.0	—	—	500	—	—	+	B. albus and B. albus putridus.
133	Hastings, Mich.	Well	2	.200	.110	18.0	—	+	850	—	—	+	M. aquatilis magnus, B. fluorescens liquefaciens.
134	Iron Mountain, Mich.	Lake	3	.150	.080	1.300	—	—	4	—	—	+	From a deep artesian well.
135	do	Spring	3	.340	.106	1.0	—	—	2	—	—	+	
136	Ithaca, Mich.	Artesian	3	.302	.240	2.8	—	—	—	—	—	+	
137	Holland, Mich.	Hydrant	2	.068	.090	13.85	—	+	20	—	—	+	
138	do	Well	2	.514	.166	15.675	—	+	180	—	—	+	
139	do	do	2	.088	.134	6.93	—	+	120	—	—	+	B. rubidus.
140	Chicago, Ill.	Hydrant	3	.310	.198	11.55	+	+	7	—	—	+	These samples were examined for the World's Fair Commission in February and March, 1892. No. 140 contained Strept. aquatilis, B. fluorescens liquefaciens, and B. figurans. No. 141, B. gracilis aerobescens, B. ochraceus. No. 142, M. aquatilis albus and B. fluorescens nonliquefaciens. No. 143, M. aquatilis invisibilis, B. albus putridus, and B. albus anaerobescens. No. 144, M. aquatilis and B. invisibilis. No. 145, M. aquatilis albus, Diplococ. aquatilis, Strept. aquatilis, B. helvolus, and B. invisibilis. No. 146, M. aquatilis albus, M. aquatilis invisibilis, B. fluorescens liquefaciens, B. albus putridus, B. helvolus, and B. subflavus. No. 147, M. subflavus, B. fluorescens nonliquefaciens, B. fluorescens albus, and B. ochraceus.
141	do	do	3	.042	.060	10.395	+	+	90	—	—	+	
142	do	do	3	.380	.148	14.850	+	+	4	—	—	+	
143	do	do	3	.178	.166	8.25	+	+	6	—	—	+	
144	do	do	3	.440	.196	10.98	+	+	9	—	—	+	
145	do	do	3	.176	.106	13.2	+	+	48	—	—	+	
146	do	do	3	.140	.106	12.7	+	+	6	—	—	+	
147	do	do	3	.080	.240	18.4	+	+	60	—	—	+	
148	Dunkirk, N. Y.	do	2	.094	.160	2.78	—	—	60	—	—	+	B. fluorescens liquefaciens and B. invisibilis.
149	Holland, Mich.	do	3	.514	.166	15.67	+	+	20	—	—	+	
150	do	do	3	.188	.134	6.93	+	+	37	—	—	+	
151	Thompson, Mich.	Spring	3	.040	.196	.12	+	—	400	—	—	+	M. aquatilis.
152	do	do	3	.056	.136	.14	—	—	30	—	—	+	
153	Ishpeming, Mich.	Lake	1	.080	.090	.75	+	—	575	—	—	+	B. putridus and B. fluorescens liquefaciens, with an undetermined germ. Animals treated with 1 c. c. of the beef-tea cultures 24 hours old suffered severely with diarrhea, but recovered.
154	Ashland, Wis.	Hydrant	1	.955	.440	.5	+	—	880	—	—	+	B. putridus, B. fluorescens liquefaciens, and an undetermined organism. Animals suffered from diarrhea.
155	do	do	1	.050	.300	.5	+	—	590	—	—	+	
156	Amasa, Mich.	Unknown	3	.016	.013	12.5	—	—	10	—	—	+	
157	do	do	3	.032	.360	6.7	+	+	750	—	—	+	No. 157 contained B. fluorescens liquefaciens.
158	Hancock, Mich.	Lake	3	.070	.400	2.0	—	—	190	—	—	+	
159	Bay City, Mich.	Well	3	.304	.125	14.05	+	+	390	—	—	+	
160	Amasa, Mich.	do	3	.036	.150	1.1	—	—	10	—	—	+	
161	do	do	3	.016	.230	1.1	—	—	250	—	—	+	
162	do	do	3	.020	.330	1.2	—	—	50	—	—	+	
163	do	do	8	.260	.240	7.0	—	—	2,000	—	—	+	No. 163 contained B. aurantius, M. aquatilis, and M. aquatilis magnus.
164	do	do	1	.300	.240	2.9	—	—	1,200	+	+	+	Some cases of typhoid in family using this water. B. venenosus.
165	Okemos, Mich.	do	1	.158	.360	4.9	+	+	90	—	—	+	Three cases of typhoid in family using this water.
166	do	do	1	.160	.350	4.8	+	+	95	—	—	+	
167	East Lake, Mich.	do	1	.070	.120	2.0	—	—	5,840	—	—	+	
168	Port Huron, Mich.	Hydrant	1	.020	.060	2.0	—	—	4,874	+	+	+	Numerous cases of typhoid in Port Huron. B. venenosus brevis.
169	Pontiac, Mich.	Well	1	.800	.020	120.0	+	+	480	—	—	+	All members of family using this water had been sick with fever resembling typhoid.
170	Bay City, Mich.	do	3	.100	.060	.2	+	+	19,440	—	—	+	
171	Ishpeming, Mich.	Lake Teal ice.	3	.100	.060	.08	+	—	3,888	—	—	+	M. cereus.
172	do	Lake Michigan ice.	3	.101	.070	.80	+	—	3,880	—	—	+	B. fluorescens liquefaciens.
173	Clio, Mich.	Unknown	3	—	—	1.23	—	—	100	—	—	+	M. aquatilis magnus, B. fluorescens liquefaciens, and B. figurans.
174	Kalamazoo, Mich.	Well	3	.040	.120	2.10	+	+	200	—	—	+	
175	do	do	3	.020	.100	2.3	+	+	350	—	—	+	
176	do	do	3	.030	.140	2.45	+	+	355	—	—	+	
177	Ann Arbor, Mich.	River	2	.018	.048	1.9	—	—	100	+	+	+	B. coli communis.
178	do	Spring	3	.020	.018	.75	—	—	30	—	—	+	B. ochraceus and B. helvolus.
179	Kalamazoo, Mich.	Well	3	.002	.004	.825	+	+	100	—	—	+	M. luteus, M. aquatilis albus.
180	Nortville, Mich.	do	2	.010	.050	3.500	+	+	4,300	+	+	+	B. coli communis.
181	Negaunee, Mich.	Lake Teal	1	.060	.400	.750	+	+	2,600	+	+	+	Proteus group.
182	Ironwood, Mich.	River	2	.080	.350	.500	—	—	250	—	—	+	
183	do	Lake	3	.018	.300	1.000	—	—	150	—	—	+	M. luteus, M. aquatilis albus, and B. albus.
184	Iron Mountain, Mich.	do	3	.006	.400	.200	—	—	100	—	—	+	Diplococ. aquatilis and B. fluorescens liquefaciens.
185	Norway, Mich.	Mine	3	.005	.100	1.6	+	—	100	—	—	+	No. 185 contained B. fluorescens liquefaciens and B. figurans. No. 186, B. fluorescens liquefaciens and M. cereus. No. 187, B. fluorescens liquefaciens and Diplococ. aquatilis.
186	do	do	3	.005	.080	1.4	+	—	60	—	—	+	
187	do	do	3	.002	.300	1.2	+	—	300	—	—	+	
188	Montgomery, Ala.	Hydrant	3	.005	.040	1.5	—	—	115	—	—	+	B. helvolus and B. ochraceus.
189	do	do	3	.005	.040	1.5	—	—	175	—	—	+	
190	Ironwood, Mich.	Well	2	.100	.200	3.0	+	+	600	+	+	+	B. coli communis.
191	Iron Mountain, Mich.	do	1	.005	.050	.2	—	—	3,500	+	+	+	B. venenosus brevis, B. coli communis.
192	Lowell, Mich.	do	3	.050	.400	.3	—	—	25	—	—	+	B. ochraceus.
193	Ishpeming, Mich.	Lake	3	.030	.100	2.0	+	+	320	—	—	+	
194	Lowell, Mich.	Well	2	.020	.500	.5	+	+	13,000	+	+	+	B. coli communis.
195	Cadillac, Mich.	Lake	3	.050	.050	.4	+	—	.10	—	—	+	Orange sarcine.
196	Ironwood, Mich.	Well	2	.020	.060	44.5	+	+	455	—	—	+	
197	Howell, Mich.	do	3	.010	.160	.89	+	—	4,000	—	—	+	B. subtilis and B. bipolaris aquatilis.
198	do	do	3	.010	.160	.89	+	—	4,000	—	—	+	
199	Merrill, Mich.	do	2	.055	.010	4.30	—	+	10	—	—	+	
200	Sherwood, Mich.	do	1	—	—	—	—	—	464	—	—	+	Typhoid fever in the family using this water. M. candidans and B. aquatilis albus.
201	Ironwood, Mich.	River	1	.050	.100	5.0	+	+	—	+	+	+	B. venenosus. In May, 1893, scattered cases of typhoid began to appear at Ironwood. Samples were sent from wells, but failed to show any evidence of suspicious germs. These samples were from public water supply. Several hundred cases developed.
202	do	do	1	.070	.180	5.0	+	+	384	+	+	+	
203	do	do	1	.008	.050	5.0	+	+	231	+	+	+	

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
204	Grand Forks, N. Dak.	River.....	1	0.020	0.060	1.6	—	—	42	+	+	+	During the fall and winter of 1893-94 there was a severe epidemic of typhoid at Grand Forks, N. Dak. In November there were 2 cases. In December, 230 cases; in January, 712; in February, 231; in March, 46; in April, 26; and in May, 1. Our first analysis was made Jan. 29, 1894, and after this a general recommendation to boil the water was issued by Mayor Whitehead. The water supply is from Red Lake River, while the ice examined is from Red River, above the confluence of these streams. The fatal contamination most likely came from Red Lake River.
205	do	do	1	1.700	.070	1.6	—	—	50	+	+	+	
206	do	River ice	1	.030	2.000	2.0	—	—	6,400	+	+	+	
207	Petoskey, Mich.	Lake	3	.002	.008	.82	—	—	5	—	—	+	
208	do	do	3	.002	.006	.82	—	—	8	—	—	+	
209	do	do	3	.002	.006	.82	—	—	10	—	—	+	
210	do	Well	3	.006	.012	2.46	—	—	22	—	—	+	
211	Holt, Mich.	do	2	.030	.050	24.7	+1	+1	2,020	—	—	+	
212	Grafton, N. Dak.	Unknown	2	.036	.028	1.65	—	+1	10,000	—	—	+	
213	Ann Arbor, Mich.	Hydrant.....	2	55	+	+	+	On May 4, 1894, it was found that the Ann Arbor water supply contained <i>B. venenosus</i> . The water at that time came from several springs, and the contamination was traced to one of the springs. During the month of May there were 5 cases of typhoid reported in the city. None in April and June. The next examination was made May 15, when the water was found to be free from suspicious organisms.
214	do	do	2	.....	.....	.....	.....	.....	.....	—	—	+
215	Saginaw, Mich.	do	2	.....	.....	1.96	—	—	100	—	—	+
216	Petoskey, Mich.	Well	2	.100	.025	11.98	+6	—	1,462	—	—	+	
217	Baraga, Mich.	Hydrant	1	.700	.210	6.0	+2	+2	120	+	+	+	
218	do	do	1	.090	.250	6.5	+3	+4	150	+	+	+	"The bacilli are motile, three times as long as broad, do not give the indol test, and are regarded as a variety of the typhoid organism."
219	do	do	1	.150	.220	6.8	+4	+4	140	+	+	+	
220	Grand Forks, N. Dak.	Red Lake River.	1	.020	.050	1.6	—	—	2,900	+	+	+	
221	do	do	1	.015	.030	1.2	—	—	1,500	+	+	+	
222	do	Red River	1	.020	.040	1.3	—	—	6,000	+	+	+	
223	do	do	1	.920	.040	1.3	—	—	8,000	—	—	+	B. venenosus was found in Red Lake River water. "The Red Lake River water is not safe in its present condition, and the Red River water is questionable. Either should be purified before use. These waters were repeatedly examined and invariably found to be contaminated. Red River water contained a larger number of germs than the Red Lake River water, but the latter occasionally contained toxicogenic germs which were never found in the former.
224	Ironwood, Mich.	Filtered	2	.030	.510	1.98	—	—	(?)	+	+	+	
225	Beloit, Wis.	Hydrant	3	.....	.....	.....	.....	.....	500	—	—	+
226	do	do	3	Trace.	.060	9.90	+4	+1	400	—	—	+	
227	Grand Rapids, Mich.	do	2	.080	.200	14.85	—	—	150	+	+	+	
228	do	do	2	.055	.215	14.85	—	—	120	+	+	+	Protens group.
229	do	do	2	.026	.052	14.65	+2	—	140	+	+	+	
230	do	do	2	.016	.030	16.5	+4	—	180	+	+	+	
231	Saginaw, Mich.	Well	1	.040	.260	9.90	+4	—	50	+	+	+	
232	Ironwood, Mich.	do	2	.180	.200	7.42	+4	+1	105	+	+	+	
233	Marine City, Mich.	Hydrant	1	.100	.112	9.90	+4	+1	3,000	+	+	+	A short, motile, nonliquefying bacillus.
234	Ironwood, Mich.	Well	2	.180	.191	4.12	+4	+10	100	+	+	+	
235	do	do	2	.010	.120	4.95	+4	+10	60	+	+	+	
236	do	River	3	Trace.	.180	1.00	+1	—	15	—	—	+	
237	Ann Arbor, Mich.	Hydrant	3	.....	.....	.....	.....	.....	.....	+	+	+
238	Grand Rapids, Mich.	do	2	.008	.056	7.13	+4	+4	10	—	—	+	B. coli communis.
239	do	do	2	.010	.052	7.13	+4	+4	5	—	—	+	
240	do	do	2	.006	.080	7.13	+4	+4	8	—	—	+	
241	Ontonagon, Mich.	Unknown	1	.600	6.600	6.60	+10	+10	20	+	+	+	
242	Petoskey, Mich.	Hydrant	3	.020	.112	1.65	—	+1	40	—	—	+	
243	Ann Arbor, Mich.	do	3	Trace.	.030	.98	—	+1	18	—	—	+	
244	Grand Rapids, Mich.	Well	2	Trace.	.040	16.5	+4	+4	600	—	—	+	
245	do	do	2	Trace.	.043	16.5	+4	+4	500	—	—	+	
246	Escanaba, Mich.	do	2	.069	.330	11.55	+4	+4	25	—	—	+	
247	do	do	2	.075	.029	11.55	+4	+4	50	—	—	+	
248	Grand Rapids, Mich.	do	2	.014	.113	16.5	+10	—	2,600	—	—	+	
249	do	do	2	.009	.136	9.9	+4	—	1,300	—	—	+	
250	do	do	2	.012	.100	16.5	+4	—	700	—	—	+	
251	do	do	2	.011	.008	13.2	+4	—	50	—	—	+	
252	Ann Arbor, Mich.	Hydrant	3	.....	.....	.....	.....	.....	.....	+	+	+
253	do	do	3	.....	.....	.....	.....	.....	.....	—	—	+
254	Menominee, Mich.	do	2	.002	.060	1.65	+1	—	100	—	—	+	
255	do	do	2	.004	.059	1.65	+1	—	15	—	—	+	
256	Grand Forks, N. Dak.	do	3	.006	.160	1.81	+1	—	20	—	—	+	
257	Ironwood, Mich.	do	3	.005	.040	3.30	+2	—	.....	—	—	+
258	Marquette, Mich.	do	2	.010	.076	8.25	—	—	50	—	—	+	
259	Port Huron, Mich.	Well	1	.006	.126	8.25	+2	—	100	—	—	+	
260	do	do	1	.007	.132	9.9	+4	—	200	+	+	+	
261	do	do	1	.009	.120	8.3	+4	—	25	+	+	+	
262	Grand Forks, N. Dak.	Ice	3	.....	.....	.....	.....	.....	.....	—	—	+
263	Detroit, Mich.	do	3	.016	.112	1.15	—	—	2	—	—	+	
264	Chicago, Ill.	Well	2	.062	.020	8.41	+4	—	60	—	—	+	
265	Marquette, Mich.	Hydrant	3	.009	.050	5.77	+1	—	50	—	—	+	
266	Adrian, Mich.	Well	2	.001	.022	12.37	+1	—	300	—	—	+	
267	do	do	2	.016	.036	18.15	+1	—	400	+	+	+	
268	do	do	2	.290	.110	5.28	+1	—	10,000	+	+	+	
269	Grand Rapids, Mich.	do	2	.016	.470	18.97	—	—	2	+	+	+	
270	do	do	2	.020	.040	13.87	—	—	45	—	—	+	
271	do	do	2	.001	.058	3.12	+6	—	75	—	—	+	
272	do	do	2	.001	.208	19.8	+1	—	50	—	—	+	
273	do	do	2	.002	.044	7.42	—	—	50	—	—	+	
274	Manistee, Mich.	Hydrant	3	.006	.082	2.47	+2	—	10	—	—	+	
275	do	do	3	.003	.075	1.65	—	—	20	—	—	+	
276	Pontiac, Mich.	Well	1	.024	.036	5.70	—	—	52	+	+	+	
A pyogenic coccus. Post-mortem showed liver studded with grayish spots containing pus. This is the only toxic coccus which we have found in drinking water.													

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
277	Ann Arbor, Mich.....	Spring.....	3	0.020	0.040	12.0	—	—	200	—	—	—	} A short, motile, nonliquefying bacillus.
278	Sherwood, Mich.....	Well.....	1	.060	.050	11.0	0.04	+ ¹⁰	10	—	—	—	
279	.....do.....	.....do.....	1	.033	.040	35.0	—	0.03	50	—	—	—
280	Flint, Mich.....	.....do.....	2	.011	.040	5.0	+ ²	+ ²	100	—	—	—
281	Burlington, Kans.....	Hydrant.....	3	.010	.040	11.0	+ ²	+ ²	100	—	—	—	} Orange sarcine.
282	.....do.....	.....do.....	3	.010	.040	11.0	+ ²	+ ²	120	—	—	—
283	Caro, Mich.....	Well.....	3	.190	.120	6.0	+ ⁴	+ ⁴	10	—	—	—	
In the summer of 1895 a number of cases of typhoid developed simultaneously among the guests at the Mexican Gulf Hotel, at Pass Christian. The samples came from an artesian well at the hotel and were sent by Doctor Le Roux. The first sample was examined July 27. The plates, which were gelatin and kept at 18–20°, showed no growth at the expiration of 24 hours. After 48 hours <i>B. luteus</i> and <i>B. coli</i> communis had developed. Death occurred in guinea pigs and rats injected with 0.5 to 2 cc. of beef-tea culture of latter. The organism was obtained from liver, spleen, and heart's blood. The recommendation was as follows: "If the jug in which the water was sent was thoroughly sterilized and the germ found really exists in the water as it is taken from the well, its use should be discontinued. As stated above, this is not a typhoid germ, but it may induce symptoms resembling those of typhoid fever." On August 16, 3 samples, 1 from the Mexican Gulf Hotel and 1 each from West End and East End artesian wells were received. The only organism detected in these waters was <i>B. albus</i> . The recommendation was as follows: "These waters in their present condition can not cause disease. Let it be understood that this statement is based exclusively on the results obtained by the bacteriological examination of the waters sent. The water from the Mexican Gulf Hotel first sent did contain a toxicogenic germ. Whether this germ was an actual constituent of the water or due to imperfect sterilization of the jug I can not tell. If there was a poisonous germ in the water it had evidently disappeared before the small bottles were sent. If this water has been contaminated once, it may become so again unless the conditions are changed. This should lead to the most careful examination." These waters were again examined Sept. 10, and <i>B. albus</i> only was found.													
284	Pass Christian, Miss.....do.....	1	.005	.001	2.0	—	—	100	—	—	—	} <i>B. venenosus, brevis.</i> A short, motile, nonliquefying bacillus.
285	.....do.....	.....do.....	1	.....	.....	.....	.....	.....	25	—	—	—
286	.....do.....	.....do.....	1	.....	.....	.....	.....	.....	10	—	—	—
287	.....do.....	.....do.....	1	.....	.....	.....	.....	.....	100	—	—	—
288	.....do.....	.....do.....	2	.020	.070	10.0	+ ⁴	—	25	—	—	—
289	.....do.....	.....do.....	2	.036	.080	30.0	+ ⁴	—	100	—	—	—
290	.....do.....	.....do.....	2	.005	.001	2.0	—	—	100	—	—	—
291	Marquette, Mich.....	Hydrant.....	3	.005	.001	2.0	—	—	50	—	—	—	} The nature of the toxicogenic germ was not determined.
292	Mount Iron, Minn.....	.....do.....	1	.020	.035	11.0	+ ¹⁰	+ ¹	100	—	—	—
293	.....do.....	.....do.....	1	.025	.030	10.0	+ ¹⁰	+ ¹	25	—	—	—
294	Adrian, Mich.....	Well.....	2	.080	.120	16.5	+ ²	+ ¹	50	—	—	—	
295	Marquette, Mich.....	Hydrant.....	3	.020	.008	3.3	+ ⁴	—	1,800	—	—	—	
296	Pontiac, Mich.....	Well.....	2	.016	.020	14.0	+ ²	+ ²	73	—	—	—	
297	.....do.....	.....do.....	2	.090	.100	6.6	+ ²	—	31	—	—	—
298	Dowagiac, Mich.....	.....do.....	2	.021	.100	1.81	—	—	45	—	—	—
299	.....do.....	.....do.....	2	.015	.130	1.80	+ ⁴	—	50	—	—	—
300	Battle Creek, Mich.....	Hydrant.....	2	.150	.220	28.0	—	—	∞	—	—	—	} None of the germs grew at 37°.
301	Escanaba, Mich.....	Lake.....	3	.040	.016	.99	+ ²	—	?	—	—	—	
302	.....do.....	Artesian.....	3	.028	.165	3.3	—	—	120	—	—	—
303	Marquette, Mich.....	Hydrant.....	2	.006	.120	4.1	+ ⁴	—	325	—	—	—	
304do.....do.....	2	.048	.132	4.12	—	—	475	—	—	—	} The health officer of Duluth reports 2,020 cases of typhoid, with 92 deaths, in 1896. These analyses were made Feb. 10 of that year. The following is a copy of the conclusions arrived at after the analysis: "This germ is not identical with the typical Eberth bacillus, but it belongs to the same group. Its chief characteristics are as follows: (1) It is motile; (2) does not liquefy gelatin; (3) does not coagulate milk; (4) it does not give the indol test; (5) it forms a yellowish-white growth on potato; (6) in pure cultures it is pathogenic to rats and produces effects on this animal that can not be distinguished from those produced by the typical Eberth germ. It is the belief of the undersigned that water containing this germ is not a safe drinking water."
305	Duluth, Minn.....	Reservoir.....	1	.....	.....	.....	.....	.....	∞	—	—	—
306	.....do.....	.....do.....	1	.....	.....	.....	.....	.....	∞	—	—	—
307	Marquette, Mich.....	Hydrant.....	2	.006	.120	4.1	+ ⁴	—	325	—	—	—	} This analysis, compared with previous ones of Grand Forks, shows what may be accomplished by filtration.
308	.....do.....	.....do.....	2	.....	.....	.....	.....	.....	.....	—	—	—
309	.....do.....	.....do.....	2	.....	.....	.....	.....	.....	.....	—	—	—
310	Grand Forks, N. Dak.....	.....do.....	2	.030	.070	1.5	—	—	50	—	—	—
311	East Tawas, Mich.....	Well.....	2	.005	.620	9.9	+ ⁴	+ ⁴	27	—	—	—	
312	Marquette, Mich.....	Hydrant.....	2	.048	.014	8.2	—	+ ²	24	—	—	—	
313	Grand Forks, N. Dak.....	.....do.....	3	.030	.010	Trace.	—	—	4	—	—	—
314	Marquette, Mich.....	Hydrant.....	2	.030	.100	6.0	—	+ ⁴	10	—	—	—	} These waters were all collected at practically the same time and examined between Apr. 27 and May 2. The nature of the toxicogenic germ was not determined.
315	Menominee, Mich.....	.....do.....	2	.010	.050	6.0	—	—	750	—	—	—
316	.....do.....	.....do.....	2	.031	.060	6.0	—	—	100	—	—	—
317	.....do.....	.....do.....	2	.010	.050	6.0	—	—	90	—	—	—
318	.....do.....	.....do.....	2	.030	.010	6.0	—	—	150	—	—	—
319	.....do.....	.....do.....	2	.009	.095	6.0	—	—	200	—	—	—
320	.....do.....	.....do.....	2	.008	.070	6.0	—	—	200	—	—	—
321	.....do.....	.....do.....	2	.088	.080	6.0	—	—	240	—	—	—

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, *et cetera*.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
322	Holland, Mich	Well	2	0.070	0.060	82.5	+4	+4	900	+	+	+	The nature of the toxicogenic germ was not determined.
323	Marquette, Mich	Hydrant	2	.040	.030	3.3	—	—	—	—	—	+	
324	Ann Arbor, Mich	Spring	3	.010	.080	19.0	—	—	12	—	—	+	
325	do	do	3	.006	.010	12.0	—	—	10	—	—	+	
326	Pontiac, Mich	Well	1	.044	.174	1.48	+4	+4	100	+	+	+	
327	Duluth, Minn	Lake	2	25	—	—	+	B. coli communis (?). These analyses were made June 12, 1896, after the cessation of the epidemic of typhoid. The first, No. 327, was taken from the end of the intake pipe, 358 feet from the shore, at a depth of 31 feet from the surface. No. 329 was taken from a well below the pumping station of the Duluth Gas and Water Company. No. 330 was taken from the reservoir of the water company.
328	do	do	2	.....	.....	.....	.....	.....	1	—	—	+
329	do	Well	2	.....	.....	.....	.....	.....	400	—	—	+
330	do	Reservoir	2	.....	.....	.....	.....	.....	4	—	—	+
331	Marquette, Mich	Hydrant	2	.050	.020	4.0	—	—	10	—	—	+	
332	Hancock, Mich	do	3	.028	.136	4.95	+4	+4	128	—	—	+	This sample was really from Lake Superior farther out than the Marquette intake at that time.
333	Marquette, Mich	do	2	.006	.004	1.65	—	—	60	—	—	+	
334	Menominee, Mich	Artesian	3	.074	.009	18.1	+4	+4	960	+	+	+	
335	Grand Rapids, Mich	Spring	3	.128	.013	2.47	—	—	21	—	—	+	B. coli communis. This water was from a surface spring.
336	Marquette, Mich	Hydrant	2	.008	.010	8.2	—	—	414	—	—	+	
337	Menominee, Mich	Artesian	3	.010	.080	18.15	—	—	7	—	—	+	
338	Milwaukee, Wis	Hydrant	2	.002	.010	.91	—	—	8	—	—	+	No. 338 was examined Sept. 5, 1896. The next 3 Sept. 17 and No. 342 Sept. 25. Evidently there was some temporary contamination; B. coli communis, B. pyocyaneus, and proteus vulgaris.
339	do	do	2	.005	.006	.92	—	—	23	+	+	+	
340	do	do	2	.005	.070	.91	—	—	38	+	+	+	
341	do	do	2	.005	.607	.93	—	+	75	+	+	+	
342	do	do	2	.013	.010	.93	—	—	25	+	+	+	
343	University, Miss	Well	3	.008	.004	2.14	—	+3	20	—	—	+	Cases of typhoid among people using this water. A slowly motile, nonliquefying organism; probably belonged to colon group.
344	Union City, Mich	do	1	.002	.024	14.8	+5	+3	17,000	+	+	+	
345	Marquette, Mich	Hydrant	2	.006	.013	6.0	—	—	80	—	—	+	
346	do	do	2	.012	.020	13.2	+5	—	5,180	—	—	+	
347	Traverse City, Mich ..	Well	2	.002	.034	8.25	+6	—	150	—	—	+	
348	do	do	2	.026	.030	8.25	+5	+	2,940	+	+	+	B. coli communis.
349	Mancelona, Mich	do	2	.009	.045	8.2	+6	+5	150	+	+	+	
350	Marquette, Mich	Hydrant	2	.006	.048	6.6	—	—	68	—	—	+	
351	Mancelona, Mich	Well	2	.013	.050	8.3	+5	—	40	+	+	+	Do.
352	Marquette, Mich	Hydrant	2	.004	.020	6.6	—	—	17	—	—	+	
353	do	do	2	.004	.009	8.2	—	—	6,300	+	+	+	
354	Union City, Mich	Well	2	.001	.003	29.9	+6	+6	54	—	—	+	Do.
355	do	Hydrant	2	.008	.026	9.9	+5	+5	36	—	—	+	
356	Marquette, Mich	do	2	.002	.013	8.2	—	—	116	—	—	+	
357	Gladstone, Mich	Well	2	.001	.034	16.5	+5	+5	850	—	—	+	
358	Marquette, Mich	Hydrant	2	.002	.015	8.25	—	—	50	—	—	+	
359	Pewabic, Mich	Filtered	3	.016	.066	4.95	+5	+5	51	—	—	+	
360	Gladstone, Mich	Well	2	Trace.	.021	6.6	+5	+5	7,500	—	—	+	
361	Marquette, Mich	Hydrant	2	.005	.018	8.2	+5	+5	30	—	—	+	
362	do	do	2	.004	.021	6.6	—	—	?	—	—	+	
363	Utica, Mich	Well	2	.016	.013	18.15	—	—	?	—	—	+	
364	Marquette, Mich	Hydrant	2	.005	.017	6.06	—	—	340	—	—	+	
365	Pontiac, Mich	Well	2	.028	.018	56.7	—	—	30	—	—	+	
366	Marquette, Mich	Hydrant	2	.003	.008	6.06	—	—	163	—	—	+	
367	Mount Pleasant, Mich ..	do	3	.120	.021	181.5	+5	+10	360	—	—	+	
368	Marquette, Mich	do	2	.003	.015	3.3	+6	+6	50	—	—	+	
369	Battle Creek, Mich	do	2	.005	.029	13.2	—	+5	954	—	—	+	
370	East Lake, Mich	do	2	.065	.140	2.0	.05	+6	125	—	—	+	
371	Mount Pleasant, Mich ..	do	2	.043	.120	19.8	+6	+2	74	—	—	+	
372	Marquette, Mich	do	2	.012	.060	6.6	—	—	250	+	+	+	Do.
373	Traverse City, Mich ..	Well	2	.005	.060	3.3	—	—	12	—	—	+	
374	Marquette, Mich	Hydrant	2	.016	.072	6.6	—	—	560	—	—	+	
375	Lansing, Mich	do	2	.013	.021	8.25	—	—	124	—	—	+	
376	do	do	2	.021	.018	14.8	—	—	150	—	—	+	
377	Battle Creek, Mich	do	2	.010	.010	3.3	+6	+6	62	—	—	+	
378	Wayne, Mich	River	∞	—	—	+	
379	do	do .....	.....	.....	.....	.....	.....	.....	∞	—	—	+
380	Marquette, Mich	Hydrant	2	.015	.056	5.0	—	—	5	—	—	+	
381	Greenville, Mich	Well	1	550	—	—	+	
382	Lansing, Mich	Hydrant	2	.....	.....	.....	.....	.....	97	—	—	+
383	Norway, Mich	Well	3	.444	1.000	16.5	—	—	180	—	—	+	
384	Marquette, Mich	Hydrant	2	.013	.010	4.9	—	—	20	—	—	+	
385	do	do	2	.013	.013	4.9	—	—	8	—	—	+	
386	Ontonagon, Mich	Well .....	.....	.....	.....	.....	.....	.....	64	—	—	+
387	do	do	81	—	—	+	
388	Shepherd, Mich	do .....	.....	.....	.....	.....	.....	.....	8	—	—	+
389	do	do .....	.....	.....	.....	.....	.....	.....	6	—	—	+
390	Fremont, Mich	do	28	—	—	+	
391	do	do .....	.....	.....	.....	.....	.....	.....	35	—	—	+
392	do	do .....	.....	.....	.....	.....	.....	.....	1,102	—	—	+
393	Marquette, Mich	Hydrant	2	.008	.016	4.95	—	—	80	—	—	+	B. coli communis.
394	Grand Forks, N. Dak ..	Well	1	.029	.040	4.25	+6	+5	340	+	+	+	
395	do	do	2	.010	.024	41.2	+5	+5	400	—	—	+	
396	Wyandotte, Mich	do	2	.024	.082	42.2	—	—	35	—	—	+	Do.
397	do	do	2	.010	.016	9.9	—	—	68	—	—	+	
398	do	do	2	.008	.016	46.2	—	—	40	—	—	+	
399	Marquette, Mich	Hydrant	2	.005	.008	4.95	—	—	15	—	—	+	

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
400	St. Clair, Mich	Hydrant	1	.008	.013	8.25	+ ⁵	—	15	++	++	++	In March, 1898, a serious epidemic of typhoid appeared at St. Clair, and the public water supply was clearly responsible for the disease. This water was repeatedly examined, and a typical colon bacillus was obtained each time. Every known process for the separation of typhoid and colon bacilli was tried (except that of making a number of cultures from every plate, even when the colonies have the same appearance, and which is now used in this laboratory), but the results were always negative. The germ obtained was a short, slightly motile bacillus with rounded ends. It coagulated milk within 24 hours, gave the indol test, reddened litmus, and evolved gas on glucose and lactose media. The public water supply was taken from the St. Clair River, and it was supposed to be taken at a distance of some 200 feet from the shore, but investigation showed that the intake pipe had been broken by the ice and the water was, in fact, taken from not more than 20 feet of the shore. Within a quarter of a mile above this point several privies empty into the river. The intake pipe was repaired and extended a distance of about half a mile and beyond a long sandbar which runs parallel with the shore, and after this was done the epidemic ceased. It was at first believed by the people of St. Clair that their water supply was contaminated by the sewage of Port Huron, some 10 miles up the river, and the water of the St. Clair River at the mouth of Black River, carrying the sewage of Port Huron, was examined. In this was found a highly motile bacillus which coagulated milk, reddened litmus, evolved gas, and gave the indol reaction. This water is contaminated with fecal matter, and the colon bacillus found in it is highly virulent. However, there is no reason for supposing that the epidemic at St. Clair was due to infection at Port Huron, for the following reasons: (1) The main current of the river was beyond the sandbar at St. Clair. (2) The broken pipe at St. Clair and the privy vaults were sufficient to account for the contamination of the St. Clair River. (3) The epidemic promptly ceased as soon as the local conditions were improved, notwithstanding the fact that Port Huron continued to empty its sewage into the river.
401	do	River	1	.005	.008	8.25	+ ⁵	—	10	++	++	++	
402	do	do	1	.005	.008	8.25	+ ⁴	—	11	++	++	++	
403	do	do	1	.003	.076	7.00	+ ⁵	—	8	++	++	++	
404	Port Huron, Mich	do	2	.004	.058	13.5	.004	.005	8	+	+	+	Examined after the extension of the water pipe.
405	Marquette, Mich	Hydrant	2	.013	.021	6.6	—	—	230	—	—	—	
406	Detroit, Mich	do	2	.010	.012	9.9	+ ⁵	+ ⁵	26	+	—	—	
407	do	do	2	.010	.005	4.9	—	—	7	—	—	—	
408	do	do	2	.001	.006	9.9	—	—	5	—	—	—	B. coli communis.
409	do	do	2	.001	.006	4.95	—	—	6	—	—	—	
410	do	do	2	.001	.008	9.8	—	—	34	—	—	—	
411	Marquette, Mich	do	2	.016	.024	6.6	—	—	63	—	—	—	
412	St. Clair, Mich	do	2	.008	.016	8.2	—	—	120	—	—	—	Do. A short, thick, motile bacillus, which coagulated milk, but did not give the indol test.
413	do	do	2	.008	.016	8.2	—	—	52	—	—	—	
414	do	do	2	.005	.016	8.2	—	—	12	—	—	—	
415	Marquette, Mich	do	2	.008	.016	6.6	—	—	2,688	+	+	+	
416	Quinnesec, Mich	Artesian	2	.053	.028	297.0	+ ²	+ ²	120	+	+	+	A small outbreak of typhoid. The germ belongs to the proteus group.
417	Marquette, Mich	Hydrant	2	.008	.016	6.6	—	—	350	—	—	—	
418	Yale, Mich	Well	2	.021	.026	16.5	+ ⁵	+ ⁵	30	—	—	—	
419	Ann Arbor, Mich	Spring	3	.010	.250	7.0	+ ⁴	—	200	—	—	—	
420	do	Well	2	.080	.080	4.9	+ ⁵	+ ⁵	52	—	—	—	These waters were taken from wells in the city of Saginaw which it was thought might be contaminated on account of their location. B. coli communis.
421	Marquette, Mich	Hydrant	2	.002	.016	6.6	—	—	15	+	+	+	
422	do	do	2	.001	.018	6.87	—	—	20	+	+	+	
423	do	do	2	.002	.012	6.6	—	—	—	—	—	—	
424	Lansing, Mich	Well	2	.016	.006	6.6	—	—	—	—	—	—	These waters were from Wolf Creek after and before filtration through Jewell filters.
425	do	do	2	.026	.006	6.6	—	—	—	—	—	—	
426	Island Lake, Mich	Lake	3	.144	.324	16.5	+ ⁵	—	549	—	—	—	
427	Marquette, Mich	Hydrant	1	.020	.016	6.8	—	—	800	—	—	—	From Lake Superior; no growth at 38°. The toxicogenic germ was not identified.
428	Flushing, Mich	Well	1	.012	.010	16.5	—	—	750	+	+	+	
429	do	do	1	.006	.006	16.5	+ ¹	—	900	+	+	+	
430	do	do	1	.042	.006	26.8	—	—	150	+	+	+	
431	do	do	1	.002	.014	35.5	+ ⁵	+ ¹	2,250	+	+	+	These waters were taken from Wolf Creek after and before filtration through Jewell filters.
432	do	do	1	.002	.008	75.9	+ ⁵	+ ¹	15	—	—	—	
433	do	do	1	.008	.009	44.5	+ ⁴	—	—	—	—	—	
434	Marquette, Mich	Hydrant	2	.001	.008	6.6	+ ⁵	+ ⁵	750	—	—	—	
435	Saginaw, Mich	Well	2	.040	.060	41.2	+ ⁵	+ ⁵	520	—	—	—	These waters were taken from wells in the city of Saginaw which it was thought might be contaminated on account of their location. B. coli communis.
436	do	do	2	.040	.080	67.8	+ ⁵	+ ⁵	40	+	+	+	
437	do	do	2	.080	.740	70.9	0.8	+ ⁵	800	—	—	—	
438	do	do	2	.030	.300	62.7	+ ⁵	+ ⁵	250	—	—	—	
439	do	do	2	.120	.060	170.0	+ ⁵	+ ⁵	150	—	—	—	These waters were from Wolf Creek after and before filtration through Jewell filters.
440	do	do	2	.300	.040	56.1	+ ⁵	+ ⁵	6	—	—	—	
441	Marquette, Mich	Hydrant	2	.025	.130	6.0	+ ⁵	—	—	—	—	—	
442	do	do	2	.026	.045	7.0	+ ⁵	—	—	—	—	—	
443	Adrian, Mich	Filtered	3	.060	.150	15.0	+ ⁵	+ ⁵	—	—	—	—	From Lake Superior; no growth at 38°. The toxicogenic germ was not identified.
444	do	Unfiltered	3	.060	.220	16.0	+ ⁵	+ ⁵	450	—	—	—	
445	Marquette, Mich	Lake	3	.015	.120	4.1	—	—	11	+	+	+	
446	do	Inside break-water.	2	.100	.360	5.0	+ ¹⁰	+ ²	—	—	—	—	
447	do	Hydrant	2	.030	.080	5.0	—	—	—	—	—	—	This water was condemned on account of the high percentage of chlorides and sulphates, the amount of the latter being 11.54 parts per million.
448	do	do	2	.025	.030	5.0	—	—	—	—	—	—	
449	Battle Creek, Mich	Lake	2	.040	.320	4.5	+ ⁵	—	696	—	—	—	
450	Tawas City, Mich	Well	3	.680	.285	520.0	+ ⁵	+ ⁵	—	—	—	—	
451	Marquette, Mich	Hydrant	2	.030	.060	5.5	—	—	—	—	—	—	This water was condemned on account of the high percentage of chlorides and sulphates, the amount of the latter being 11.54 parts per million.
452	Charlevoix, Mich	Well	3	.900	.220	16.5	+ ²	—	—	—	—	—	
453	Ann Arbor, Mich	Hydrant	3	.030	.080	11.5	+ ⁴	—	—	—	—	—	
454	Marquette, Mich	do	2	.060	.060	3.3	—	—	—	—	—	—	
455	Holland, Mich	do	3	.080	.030	6.6	+ ⁴	+ ⁴	—	—	—	—	

Table showing the results of 706 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
456	St. Johns, Mich.....	Well.....	2	.060	.060	38.0	—	—	—	—	—	+	
457	Mackinac Island, Mich.....	do.....	2	.030	.060	10.8	—	+1	—	—	—	+	
458	Rock Island, Ill.....	do.....	2	.030	.080	57.75	+5	+5	—	—	—	+	This water contained a total residue of 1,460 parts per million. The residue after ignition was 906 parts. The following report was made: "There is no reason to believe that this water could cause an infectious disease. However, a water with so high a percentage of solids can not be called a good drinking water."
459	Ypsilanti, Mich.....	do.....	2	.300	.080	26.4	—	—	∞	—	—	+	
460	Marquette, Mich.....	Hydrant.....	2	.030	.060	5.5	—	—	—	—	—	+	
461	Alpena, Mich.....	do.....	2	.060	.151	5.0	—	+3	—	—	—	+	
462	do.....	do.....	2	.030	.070	5.0	—	+3	—	—	—	+	
463	do.....	do.....	2	.020	.060	5.0	—	+3	—	—	—	+	
464	Escanaba, Mich.....	do.....	2	.030	.150	6.6	—	+4	—	—	—	+	
465	Marquette, Mich.....	do.....	2	.020	.050	4.0	—	—	—	—	—	+	
466	do.....	do.....	2	.070	.060	5.0	—	—	—	—	—	+	
467	Shelby, Mich.....	Well.....	2	.020	.080	71.0	+6	+6	—	—	—	+	
468	do.....	Spring.....	1	—	—	—	—	—	—	—	—	+	
469	do.....	Well.....	1	.001	.100	3.3	—	+2	—	—	—	+	{ A local outbreak of typhoid fever led to this analysis. The persons who had typhoid had possibly taken water from these three sources. The toxicogenic germ in No. 467 was not identified.
470	Munising, Mich.....	Hydrant.....	3	—	—	3.3	—	—	100	—	—	+	
471	Kalamazoo, Mich.....	Well.....	2	.040	.080	8.2	—	—	600	—	—	+	
472	Marquette, Mich.....	Hydrant.....	2	.050	.080	5.0	—	—	—	—	—	+	
473	Wells, Mich.....	Well.....	3	.160	.040	6.6	+4	+7	∞	—	—	+	The large number of germs and the amount of free ammonia led to the suggestion that these waters be carefully watched and subsequent analyses made.
474	do.....	do.....	3	.250	.050	5.0	+4	—	800	—	—	+	
475	do.....	do.....	3	.040	.050	9.5	+4	—	∞	—	—	+	
476	Marquette, Mich.....	Hydrant.....	2	.040	.060	5.0	—	—	730	+	+	+	B. coli communis.
477	do.....	do.....	2	.030	.040	4.0	+2	—	600	—	—	+	
478	do.....	do.....	2	.020	.050	5.0	+2	—	800	—	—	+	
479	do.....	do.....	2	.060	.050	4.5	—	—	560	—	—	+	
480	Springwells, Mich.....	Well.....	1	.040	.140	99.0	+7	+3	—	+	+	+	This well is located about 20 feet from a cesspool and is supposed to be contaminated by typhoid urine and feces. Two toxicogenic germs found in this water, one belonging to the proteus group and the other is a nonliquefying, nonmotile bacillus, probably B. coli communis.
481	Ross, Mich.....	do.....	1	—	—	—	—	—	—	+	+	+	B. coli communis.
482	Greenville, Mich.....	do.....	1	1.460	.040	38.0	—	+2	—	+	+	+	Do.
483	Marquette, Mich.....	Hydrant.....	2	.030	.040	5.0	—	—	—	—	—	+	
484	Battle Creek, Mich.....	Unfiltered.....	2	.140	.320	5.0	—	—	20	—	—	+	It appears that filtration of this water did not reduce either free or albuminoid ammonia. The filtration was through an experimental Jewell filter with the addition of 1 grain of sulphate of aluminum to the gallon.
485	do.....	Filtered.....	2	.140	.300	3.3	—	—	10	—	—	+	
486	Gladstone, Mich.....	Well.....	3	.030	.040	6.6	—	—	1,500	—	—	+	
487	Saginaw, Mich.....	do.....	2	.260	.040	287.0	—	—	940	—	—	+	
488	Clarkville, N. Mex.....	do.....	2	.750	.180	33.0	—	+4	—	—	—	+	While the inoculations and other tests made show the absence of toxicogenic germs, the chemical examination gives indication of serious contamination from sewage or surface drainage. Such a water should be regarded with suspicion and it is recommended that its use be discontinued. If this is not possible, it should be boiled before used.
489	Ann Arbor, Mich.....	do.....	3	.120	.100	23.0	—	—	10	—	—	+	
490	Lansing, Mich.....	Hydrant.....	2	.120	.120	16.5	+4	+4	250	—	—	+	
491	do.....	do.....	2	.140	.080	16.5	+3	+1	220	—	—	+	
492	Ann Arbor, Mich.....	Well.....	3	.010	.040	33.0	—	—	4	—	—	+	
493	South Haven, Mich.....	Hydrant.....	2	—	—	—	—	—	—	—	—	+	
494	Pontiac, Mich.....	Well.....	1	.050	.260	9.9	—	—	940	+	+	+	B. venenosus.
495	do.....	do.....	1	.100	.500	8.25	—	—	3,360	+	+	+	Do.
496	do.....	do.....	1	.260	.080	57.7	—	—	80	+	+	+	
497	do.....	do.....	1	.060	.280	6.6	—	—	30	+	+	+	Do.
498	do.....	do.....	1	.080	.360	9.9	—	—	120	+	+	+	
499	Island Lake, Mich.....	Lake.....	2	.260	.120	—	—	—	∞	+	+	+	B. venenosus. It is an interesting fact that on the shore of this small lake the Michigan regiments recruited in 1898 at their State encampment, and here the Thirty-fifth Michigan developed a serious epidemic of typhoid. The analysis was made Aug. 2, 1900. The object in making it was to determine whether or not this would be a suitable place for the encampment of the Michigan troops at that time. This lake is quite remote from any village, receives no waste except from a few farmhouses, and is not used as a water supply.
500	Mount Clemens, Mich.....	Hydrant.....	2	.030	.160	23.1	+4	—	200	—	—	+	
501	Brighton, Mich.....	Well.....	1	.080	.050	14.8	+4	—	300	—	—	+	
502	Mount Clemens, Mich.....	Hydrant.....	2	.030	.150	21.45	+4	—	8,400	—	—	+	
503	Ishpeming, Mich.....	do.....	1	.350	.240	8.0	—	—	—	+	+	+	
504	do.....	do.....	1	.360	.500	10.0	11.0	—	—	+	+	+	
505	do.....	do.....	1	.470	.310	7.0	+4	—	—	+	+	+	
506	Yale, Mich.....	Well.....	1	.570	.120	86.0	—	—	—	+	+	+	
507	Negaunee, Mich.....	Lake.....	1	.480	.230	—	—	—	—	+	+	+	
508	Battle Creek, Mich.....	Filtered.....	2	.150	.410	5.0	—	—	780	+	+	+	B. coli communis.
509	Ishpeming, Mich.....	Lake.....	2	.10	.40	2.0	—	—	—	+	+	+	Do.
510	Makitowoc, Mich.....	Well.....	2	.20	.09	16.5	+4	+6	∞	—	—	+	
511	Kalamazoo, Mich.....	do.....	2	.04	.08	9.6	+5	+1	—	—	—	+	
512	Okemos, Mich.....	do.....	1	.03	.16	105.0	+6	+6	∞	—	—	+	
513	do.....	do.....	1	.02	.16	57.7	+6	—	480	+	+	+	{ An outbreak of typhoid. Samples from 2 wells, both used by the public. The toxicogenic germ was not identified, but the use of this water was discontinued and the epidemic disappeared.
514	Morrice, Mich.....	do.....	1	.04	.07	102.2	—	—	600	—	—	+	
515	Laporte, Mich.....	do.....	1	.02	.20	9.9	+2	—	31,680	—	—	+	
516	Ann Arbor, Mich.....	do.....	2	.04	.04	75.0	—	—	600	—	—	+	
517	Negaunee, Mich.....	Spring.....	3	.06	.14	—	—	—	—	—	—	+	

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No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
518	Alpena, Mich.	River.	2	0.11	0.13	0.9	—	—	27,000	++	++	++	} B. coli communis.
519	do.	do.	2	.11	.13	.5	—	—	30,000	++	++	++	
520	do.	do.	2	.05	.10	.5	—	—	6,000	++	++	++	
521	Stockbridge, Mich.	Well.	2	.35	.22	2.2	+ ²	—	—	—	—	—	
522	Menominee, Mich.	Hydrant.	2	.04	.15	.7	—	—	—	—	—	—	
523	do.	do.	2	.04	.13	.6	—	—	—	—	—	—	} This water comes from sand-rock formation, with fire clay above and below it. The well is 700 feet deep. There was a flow of water from same formation at depth of 250 feet, but this water was very unpleasant to drink and was injurious to iron pipes and fittings. The total residue was 712 parts per million; remaining after ignition, 641 parts. Sulphates, 220 parts per million. The large amount of germs may have been due to the length of time that elapsed between the collection of the sample and its analysis.
524	do.	do.	2	.04	.13	.7	—	—	—	—	—	—	
525	Clarkeville, N. Mex.	Well.	3	.06	.07	30.0	—	—	190,000	—	—	—	
526	Lansing, Mich.	Hydrant.	2	.18	.03	11.0	—	—	20	—	—	—	} A few cases of typhoid fever at the State school led to these tests. Those who had typhoid possibly drank from all of these sources. A motile, nonliquefying bacillus.
527	do.	do.	2	.13	.04	11.0	—	—	5	—	—	—	
528	Bay City, Mich.	Well.	2	.13	.08	6.0	—	—	50	—	—	—	
529	do.	do.	2	.10	.20	5.0	—	—	45	—	—	—	
530	Port Huron, Mich.	Hydrant.	2	.26	.48	7.0	—	—	—	—	—	—	
531	Coldwater, Mich.	Well.	1	.04	.09	8.0	+ ⁵	—	—	+	+	+	} A highly motile, nonliquefying bacillus.
532	do.	Hydrant.	1	.06	.16	8.0	+ ³	—	—	—	—	—	
533	do.	Well.	1	.10	.15	6.0	+ ⁴	+ ⁴	—	—	—	—	
534	Ishpeming, Mich.	River.	3	.47	.35	4.0	—	—	—	—	—	—	
535	do.	Hydrant.	2	.01	.28	3.0	—	—	—	—	—	—	
536	do.	River.	3	.15	1.15	10.0	—	—	—	—	—	—	} Adrian takes its water supply from a small stream known as Wolf Creek. This drains a thickly settled agricultural region. This water is filtered through Jewell filters. The analyses were made through June and July, 1901. The toxicogenic germ found was a typical colon bacillus. There was no typhoid fever among the people drinking the water.
537	Ann Arbor, Mich.	Well.	2	.01	.01	5.0	—	—	—	+	+	+	
538	Kalamazoo, Mich.	do.	1	.10	.18	6.0	+ ⁵	+ ³	—	+	+	+	
539	Adrian, Mich.	Hydrant.	2	.08	.24	10.	—	—	100	+	+	+	
540	do.	do.	2	.13	.23	10.0	—	—	100	+	+	+	
541	do.	do.	2	.08	.24	10.0	—	—	60	+	+	+	} Elk Rapids takes its water supply from Elk Lake, which undoubtedly receives much contamination from surface drainage. The toxicogenic organism found in these waters at this time was a doubtful colon bacillus. It did not coagulate milk until after 72 hours. It did not give the indol test, but it did ferment glucose and lactose. There was no typhoid at Elk Rapids at this time, July, 1901.
542	do.	do.	2	.13	.23	10.0	—	—	100	+	+	+	
543	do.	do.	2	.13	.23	10.0	—	—	100	+	+	+	
544	do.	do.	2	.02	.14	10.0	—	—	—	+	+	+	
545	do.	do.	2	.02	.03	10.0	—	—	—	+	+	+	
546	do.	do.	2	.02	.22	10.0	—	—	—	+	+	+	} B. coli communis.
547	do.	do.	2	.04	.03	6.0	—	—	—	+	+	+	
548	Elk Rapids, Mich.	do.	1	.66	.17	6.0	—	—	—	—	—	—	
549	do.	do.	1	.67	.17	15.0	—	—	2,210	+	+	+	
550	Homestead, Pa.	do.	2	.07	.21	3.0	—	—	3,840	+	+	+	} B. coli communis.
551	Ishpeming, Mich.	Lake.	1	.19	.01	11.0	—	—	40	+	+	+	
552	Ann Arbor, Mich.	do.	1	.13	.12	37.0	—	—	16,680	+	+	+	
553	Eloise, Mich.	Well.	1	.33	.32	3.0	+ ⁷	+ ²	—	—	—	—	
554	Kalamazoo, Mich.	do.	1	.01	.01	5.1	—	—	600	—	—	—	
555	do.	Spring.	2	.53	.01	7.0	—	—	120	+	+	+	} Do.
556	Ann Arbor, Mich.	River.	2	.06	.10	29.0	—	—	19	+	+	+	
557	Howell, Mich.	Well.	3	.06	.07	29.0	—	—	462	—	—	—	
558	do.	do.	3	.06	.07	29.0	—	—	330	—	—	—	
559	do.	do.	3	.06	.07	29.0	—	—	1,440	+	+	+	
560	do.	do.	3	.06	1.00	29.0	—	—	780	+	+	+	} For several months the people of Mount Clemens drank a rich culture of B. coli communis without developing an epidemic of typhoid fever.
561	Kalamazoo, Mich.	do.	1	.01	.01	5.0	+ ²	—	160	+	+	+	
562	Petersburg, Mich.	do.	1	.72	.16	7.0	—	—	5	+	+	+	
563	Cassopolis, Mich.	do.	3	.01	.01	33.0	—	—	—	—	—	—	
564	Mount Clemens, Mich.	Hydrant.	2	.03	.04	106.0	—	—	540	+	+	+	
565	do.	do.	2	.07	.01	164.0	—	—	2,160	+	+	+	} B. coli communis.
566	Hancock, Mich.	Well.	2	.01	.01	53.0	—	—	2,500	—	—	—	
567	Kalamazoo, Mich.	do.	1	.03	.02	5.0	—	—	—	+	+	+	
568	Ann Arbor, Mich.	River ice.	3	.03	.14	4.0	—	—	—	+	+	+	
569	do.	do.	3	.03	.14	4.0	—	—	—	+	+	+	
570	Mount Clemens, Mich.	Hydrant.	2	.03	.03	180.0	—	—	65	—	—	—	} B. coli communis.
571	do.	do.	2	.01	.05	15.0	—	—	19,080	—	—	—	
572	Petoskey, Mich.	Well.	2	.01	.08	15.0	—	—	4	+	+	+	
573	do.	do.	2	.05	.07	10.3	—	—	1,440	+	+	+	
574	Mount Clemens, Mich.	Hydrant.	2	.05	.09	8.0	—	—	18,600	+	+	+	
575	do.	Lake.	3	.04	.05	5.0	—	—	—	+	+	+	} The toxicogenic germ found in these waters did not liquefy gelatin, did not produce indol, did not coagulate milk until after 72 hours, but it did produce gas in glucose and lactose.
576	Elk Rapids, Mich.	Hydrant.	3	.03	.00	5.0	—	—	—	+	+	+	
577	do.	do.	1	.02	.06	4.0	+ ²	+ ²	210	+	+	+	
578	Kalamazoo, Mich.	Well.	1	.01	.07	—	—	—	15,000	—	—	—	} B. coli communis.
579	Sault Ste. Marie, Mich.	Hydrant.	2	.01	.06	—	—	—	3,600	—	—	—	
580	do.	do.	2	.01	.01	—	—	—	39,600	—	—	—	
581	do.	do.	2	.01	.02	—	—	—	48,000	+	+	+	
582	do.	do.	2	.06	.03	—	—	—	—	+	+	+	
583	Marquette, Mich.	do.	2	.01	.01	—	—	—	25	+	+	+	} Do.
584	Kalamazoo, Mich.	Well.	2	.01	.08	36.0	—	—	4,116	+	+	+	
585	Bay City, Mich.	do.	1	.02	.06	8.0	—	—	—	+	+	+	
586	Gladstone, Mich.	do.	1	.01	1.10	3.0	—	—	12,000	+	+	+	
587	do.	do.	1	.08	.01	7.0	—	—	67,900	+	+	+	
588	Battle Creek, Mich.	Hydrant.	2	.13	.16	3.0	+ ²	+ ⁵	5,800	—	—	—	} The epidemic of typhoid at Elk Rapids in 1902 prevailed during January and February. Samples were examined Feb. 24 and May 19, 1902.
589	Elk Rapids, Mich.	do.	2	.01	.16	3.0	+ ⁶	+ ²	940	+	+	+	
590	do.	do.	2	—	—	—	—	—	3,733	+	+	+	
591	Escanaba, Mich.	do.	2	—	—	—	—	—	192,400	—	—	—	
592	do.	do.	2	—	—	—	—	—	157,000	—	—	—	
593	do.	do.	2	.07	.10	11.5	—	+ ⁵	93,000	—	—	—	} B. coli communis.
594	Flint, Mich.	do.	2	.11	.19	11.0	—	—	142	—	—	—	
595	Mount Clemens, Mich.	Well.	2	.11	.19	11.0	—	—	142	—	—	—	
596	Kalamazoo, Mich.	do.	2	.02	.11	6.0	+ ⁶	—	820	+	+	+	
597	do.	do.	1	.08	.11	8.0	+ ³	—	39,200	+	+	+	

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Cent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
598	Mount Clemens, Mich.	Well	2	0.16	0.19	7.0	—	—	100	—	—	—	
599	Battlecreek, Mich.	do	3	.42	.26	.8	—	—	8,000	—	—	—	
600	do	do	3	.67	.24	.6	—	—	1,020	—	—	—	B. coli communis.
601	do	do	1	.82	.13	5.0	—	—	100,000	—	—	—	Do.
602	Petoskey, Mich.	do	2	.04	.08	13.0	± ²	+ ³	960	—	—	—	
603	Caro, Mich.	Spring	2	.26	.01	3.3	± ³	—	87	—	—	—	
604	Elk Rapids, Mich.	Hydrant	2	.04	.17	7.0	—	—	1,200	—	—	—	
605	Grand Forks, N. Dak.	do	3	.10	.18	6.0	—	—	∞	—	—	—	A short, highly motile bacillus; does not coagulate milk nor give the indol test; B. venenosus.
606	Iron Mountain, Mich.	do	2	.40	.16	9.0	—	—	450	—	—	—	Proteus group.
607	do	Well	2	.12	.70	25.0	—	—	9,300	—	—	—	
608	Petoskey, Mich.	Hydrant	2	.14	.14	1.3	—	—	2,460	—	—	—	Highly motile, nonliquefying.
609	Menominee, Mich.	do	2	.06	.20	6.0	—	—	270	—	—	—	B. coli communis.
610	Attica, Mich.	Well	1	.10	.17	9.2	—	+ ³	1,560	—	—	—	
611	Irvine, Mich.	do	3	—	—	—	—	—	3	—	—	—	Proteus group.
612	Petoskey, Mich.	do	3	.14	.09	13.0	—	—	5,520	—	—	—	
613	Ann Arbor, Mich.	Hydrant	3	.09	.10	5.0	—	—	1,200	—	—	—	B. coli communis.
614	Menominee, Mich.	do	2	.03	.14	5.0	—	—	360	—	—	—	Slightly motile; coagulates milk; does not give indol test.
615	Kalamazoo, Mich.	Well	2	.05	.02	9.5	—	—	19	—	—	—	
616	Detroit, Mich.	Hydrant	2	.05	.19	5.0	—	—	60	—	—	—	B. coli communis.
617	Sturgis, Mich.	Lake ice	3	.05	.25	4.0	—	—	50	—	—	—	
618	Mount Clemens, Mich.	Hydrant	2	.12	.05	81.5	—	—	620	—	—	—	Do.
619	Waterford, Ontario	Ice	3	.29	.07	4.0	—	—	96	—	—	—	Do.
620	Battle creek, Mich.	Well	3	.06	.04	7.0	—	—	840	—	—	—	From a driven well 50 feet from the Kalamazoo River.
621	Flint, Mich.	Hydrant	2	.04	.39	8.5	—	—	5,000	—	—	—	Surface water; B. coli communis.
622	Negaunee, Mich.	Spring	2	.01	.02	3.0	—	—	80	—	—	—	B. coli communis.
623	Petoskey, Mich.	Well	2	.02	.03	5.0	—	—	27,000	—	—	—	Do.
624	do	do	2	.01	.02	11.0	—	—	260	—	—	—	
625	do	do	3	.02	.04	5.5	—	—	49,800	—	—	—	Do.
626	do	Lake	3	.04	.12	5.0	—	—	540	—	—	—	From Little Traverse Bay, 1,860 feet from shore and 100 feet below the surface.
627	do	Spring	3	.02	.08	29.5	—	—	1,940	—	—	—	
628	do	Lake	3	.03	.05	6.0	—	—	1,380	—	—	—	Same, 2,600 feet from shore and 127 feet below surface.
629	do	River	3	.07	.10	4.5	—	—	2,300	—	—	—	From a well 350 feet deep.
630	do	Well	3	.02	.05	32.5	—	—	80	—	—	—	
631	do	do	3	.02	.08	5.5	—	—	200	—	—	—	B. coli communis.
632	Iron Mountain, Mich.	do	1	.91	.42	89.0	+ ⁴	+ ⁴	4,450	—	—	—	Do.
633	Ironwood, Mich.	Hydrant	2	.06	.36	6.0	—	+ ³	4,300	—	—	—	Do.
634	do	Well	1	.06	.12	87.0	—	—	3,390	—	—	—	Do.
635	Alma, Mich.	Hydrant	1	.27	.02	5.0	—	—	127	—	—	—	B. venenosus.
636	do	do	1	.01	.04	3.0	—	—	6,000	—	—	—	Do.
637	do	do	1	.07	.04	12.0	—	—	360	—	—	—	Do.
638	do	Well	1	.02	.05	28.0	+ ³	—	360	—	—	—	B. coli communis.
639	do	Hydrant	1	.05	.04	9.0	—	—	160	—	—	—	B. venenosus.
640	do	Well	1	.27	.16	15.0	+ ¹	+ ⁶	240	—	—	—	Do.
641	do	do	1	.22	.03	15.0	—	—	600	—	—	—	B. coli communis.
642	do	Hydrant	1	.04	.10	4.0	—	—	3,960	—	—	—	Do.
643	Battle Creek, Mich.	Lake	2	.03	.18	3.0	—	—	480	—	—	—	One to colon and one to proteus group.
644	Harbor Point, Mich.	Hydrant	2	—	—	—	—	—	—	—	—	—	Do.
645	Oak Grove, Mich.	Well	1	.03	.01	4.0	—	—	400	—	—	—	B. coli communis.
646	Battle Creek, Mich.	Hydrant	2	.04	.16	3.0	—	—	20	—	—	—	Do.
647	Kalamazoo, Mich.	do	2	.01	.01	5.0	+ ⁴	+ ⁴	10,800	—	—	—	Belongs to proteus group.
648	Battle Creek, Mich.	Well	3	.03	.06	5.0	—	+ ³	1,440	—	—	—	B. coli communis.
649	Grass Lake, Mich.	do	1	.001	.001	9.0	—	—	300	—	—	—	
650	Menominee, Mich.	Hydrant	2	.01	.16	6.0	—	—	2,200	—	—	—	
651	Adrian, Mich.	Well	2	.05	.09	38.0	—	+ ³	9,100	—	—	—	Do.
652	Gregory, Mich.	do	1	.05	.06	11.0	—	—	5,740	—	—	—	Do.
653	Kalamazoo, Mich.	Hydrant	2	—	—	2.0	—	—	10	—	—	—	
654	Lansing, Mich.	do	2	.06	.05	12.0	—	—	8	—	—	—	
655	Battle Creek, Mich.	do	2	.01	.12	5.0	—	—	35,760	—	—	—	Contains both colon and proteus.
656	Nashville, Mich.	Well	1	.02	.02	6.0	—	—	4,800	—	—	—	Have been 6 cases of typhoid during the past three years in family using the water. Repeated bacteriological examinations have been made with negative results. Only well on the farm. It is probable that the house has become infected and that the disease is spread in this way.
657	Ann Arbor, Mich.	Spring	2	—	—	—	—	—	—	—	—	—	B. coli communis.
658	do	Hydrant	3	.02	.03	8.0	—	—	—	—	—	—	
659	Lawrence, Mich.	Well	2	.03	.04	10.5	8.5	+ ³	—	—	—	—	This water is remarkable for the amount of nitrate present.
660	Ann Arbor, Mich.	Ice	—	—	—	—	—	—	760	—	—	—	From this ice there was obtained a germ which does not liquefy gelatin, does not produce indol, does not coagulate or elaborate acid in milk, and does not ferment glucose or lactose. In other words, so far as these cultural properties go, it can not be distinguished from the typhoid bacillus. Morphologically it is a short, motile rod. It is not toxicogenic, and guinea pigs treated with 5 c.c. of a beef-tea culture 24 hours old intraabdominally are not affected.
661	Petoskey, Mich.	Lake	2	.02	.07	5.0	—	+ ²	450	—	—	—	
662	do	do	2	.03	.17	4.5	+ ²	+ ⁴	2,400	—	—	—	
663	do	do	2	.04	.08	4.5	+ ⁴	+ ²	960	—	—	—	B. coli communis.
664	do	Well	3	.07	.04	2.5	+ ⁴	+ ²	120	—	—	—	
665	Whipple Barracks, Ariz.	Hydrant	1	—	—	—	—	—	21,750	—	—	—	
666	do	Well	1	—	—	—	—	—	630	—	—	—	This water contained 3 toxicogenic germs, two of which belonged to the proteus group, while the third is a highly motile germ, does not liquefy gelatin, does not produce indol, does not coagulate milk even after ninety-six hours, but does produce gas in glucose and lactose. No. 666 came from a well dug in the river bed, which collects the waste of the greater part of the town of Prescott, Ariz. Contains two toxicogenic germs, one B. venenosus; the other slowly liquefies gelatin, elaborates indol, coagulates milk after forty-eight hours and does not ferment glucose or lactose.
667	Battle Creek, Mich.	Hydrant	2	.04	.03	3.5	—	+ ³	108,000	—	—	—	B. coli communis.
668	Traverse City, Mich.	Spring	1	.02	.02	2.5	0.8	—	4,200	—	—	—	Do.
669	do	Well	1	.02	.02	4.0	+ ²	.4	2,400	—	—	—	

Table showing the results of 700 analyses of drinking water, made in the Hygienic Laboratory of the University of Michigan, etc.—Continued.

No.	Sent from—	Source.	Class.	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Nitrates.	Nitrites.	Number of germs.	Effect on animals.	Toxicogenic.	Saprophytic.	Remarks.
670	Battle Creek, Mich...	Well.....	3	0.01	0.01	4.0	—	+2	19,800	+	+	+	This water contained 2 toxicogenic organisms, both of which are short motile rods. No. 1 does not liquefy gelatin, does not produce indol, does not form acid in milk, and does not coagulate until after seventy-two hours, and does not evolve gas in glucose or lactose solutions. This is classed as <i>B. venenosus</i> . The second does not liquefy gelatin, does not produce indol, produces abundant acid in milk during the first twenty-four hours, and coagulates during the second twenty-four hours and evolves gas from all the sugar solutions.
671	Charlotte, Mich.....	Hydrant.....	3	.008	.05	32.0	22.0	.35	8,550	—	—	+	<i>B. coli communis</i> .
672	Ann Arbor, Mich.....	do.....	2	.....	.....	.....	.....	.....	30	+	+	+	
673	do.....	Cistern.....	1	.....	.....	.....	.....	.....	9,720	—	—	+	
674	do.....	Hydrant.....	2	.....	.....	.....	.....	.....	5,400	—	—	+	
675	do.....	Cistern.....	1	.....	.....	.....	.....	.....	4,875	+	+	+	This water contained 2 toxicogenic organisms, one of which is <i>B. venenosus</i> , while the other differs from this only in the fact that it forms a large amount of acid in milk. Neither coagulates milk and neither ferments the sugars.
676	Charlotte, Mich.....	Well.....	1	.02	.03	14.0	+2	+2	.....	—	—	+	This water contains a proteus organism.
677	Battle Creek, Mich.....	do.....	3	.03	.006	4.0	—	+2	22	+	+	+	
678	Ann Arbor, Mich.....	Hydrant.....	2	.....	.....	.....	.....	.....	400	+	+	+	<i>B. coli communis</i> and proteus vulgaris.
679	Battle Creek, Mich.....	do.....	2	.09	.01	9.5	—	+2	62	+	+	+	
680	Lake View, Mich.....	Well.....	2	.....	.....	.....	.....	.....	38	+	+	+	<i>B. coli communis</i> .
681	Ann Arbor, Mich.....	Cistern.....	1	.....	.....	.....	.....	.....	4,875	+	+	+	
682	Lake View, Mich.....	Well.....	2	.....	.....	.....	.....	.....	750	—	—	+	Do. Do.
683	Saginaw, Mich.....	Ice.....	3	.07	.02	2.5	—	—	20	—	—	+	
684	do.....	do.....	3	.03	.006	2.5	—	+2	6	—	—	+	
685	do.....	do.....	3	.005	.04	2.0	—	+3	2	—	—	+	
686	Morenci, Mich.....	Well.....	1	.005	.02	24.0	7.5	+2	20	—	—	+	A motile, nonliquefying bacillus which did not coagulate milk nor ferment the sugars, but did give a feeble indol reaction.
687	Ann Arbor, Mich.....	Hydrant.....	2	.....	.....	.....	.....	.....	.....	+	+	+
688	Norway, Mich.....	Mine.....	2	.01	.03	12.0	11.0	.011	20	+	+	+	This organism is highly motile, does not liquefy, gives no indol, produces gas in glucose but not in lactose, and does not coagulate milk.
689	do.....	do.....	2	.003	.01	6.0	+2	.07	200	+	+	+	
690	do.....	Hydrant.....	2	.004	.01	9.0	+2	—	20	+	+	+	No. 693 contained a highly motile, nonliquefying bacillus which did not coagulate milk, but which did give a slight indol test, and produces gas in glucose. No. 694 contained a motile liquefying organism, probably a proteus germ.
691	Cassopolis, Mich.....	do.....	2	.07	.10	7.0	+2	.06	640	—	—	+	Colon bacillus.
692	Ann Arbor, Mich.....	do.....	2	.....	.....	.....	.....	.....	.....	+	+	+
693	Geneva, Mich.....	Well.....	1	.....	.....	.....	.....	.....	3,150	+	+	+	<i>B. coli communis</i> .
694	do.....	do.....	1	.....	.....	.....	.....	.....	300	+	+	+	
695	Ann Arbor, Mich.....	Hydrant.....	2	.....	.....	.....	.....	.....	50	+	+	+	<i>B. venenosus</i> .
696	Morenci, Mich.....	Well.....	1	.005	.018	24.0	7.5	+	20	—	—	+	
697	Traverse City, Mich.....	Creek.....	1	.....	.....	.....	.....	.....	3,600	+	+	.....	<i>B. coli communis</i> .
698	do.....	Lake.....	1	.....	.....	.....	.....	.....	120	+	+	.....
699	do.....	Well.....	1	.....	.....	.....	.....	.....	80	—	—	+	
700	do.....	do.....	1	.....	.....	.....	.....	.....	20	—	—	+	

APPENDIX II.

A PAPER ON THE CHEMICAL DISINFECTION OF DRINKING WATER, PREPARED UNDER THE DIRECTION OF THE BOARD.

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THE CHEMICAL DISINFECTION OF DRINKING WATER.

The endeavor to render a polluted water safe for drinking purposes by the addition of some chemical substance is not a recent one. Long before the development of modern bacteriology it was discovered that impure waters could be made more suitable for human consumption by the use of various substances which had the power of coagulating or precipitating out the impurities, and this method was occasionally made use of on an extensive scale in the purification of drinking water. According to Schumburg, Kaufmann mentions that the Egyptian laborers were accustomed to purify the water of the Nile by filtration and sedimentation and also by the addition of crushed peach kernels, for the same purpose as alum has been used in more recent times.

The chemical substances which have been used for the purification of water may be separated into classes, as follows:

1. Those whose action depends upon the fact that they produce a precipitate in the water, which, on account of its higher specific gravity, sinks to the bottom, carrying down with it suspended particles of organic matter, bacteria, and other gross impurities. Such substances are ordinarily known as coagulants. To this class belong ferric chloride, copper chloride, ferric sulphate, alum, chalk, and lime. Common salt has also been added to turbid water in order to make it clear, since fluid which contains much salt allows suspended substances to settle quicker than a water which is free from salt.

2. Those substances which act mainly by oxidation of the organic matter contained in the water: Substances belonging to this class are calcium permanganate (Berdas and Giraud, *Rev. d'Hyg. et de Police Sanitaire*, 1895, XVII, 328) and potassium permanganate. Hydrogen peroxide, suggested by van Hattunga and Tromp (*Waterstoffsuperoxyd ter Disinfection van Drinkwater*,

Gronigen, 1887) and Althoefer (*Centralblatt f. Bakt.*, 1890, VIII, 129), may be said to belong both to this and to the next class, since they are disinfectants as well as oxidizing agents. Hydrogen peroxide and potassium permanganate have been used together and the manganese oxide removed by filtration. Fr. Blaz, (*Apotheker Ztg.*, 1898, XIII, 728) employs sodium peroxide in the place of hydrogen peroxide. The sodium peroxide is broken up by the water into hydrogen peroxide and sodium hydroxide, the latter substance throwing out the alkaline earth carbonates. On this account the water containing sodium carbonate acquires an alkaline taste, so that Blaz, before the addition of the sodium peroxide, adds an equivalent amount of citric acid, viz, to 234 parts of Na_2O_2 420 parts of $\text{C}_6\text{H}_8\text{O}_7$.

3. Those substances which act directly upon the micro-organisms contained in the water, either destroying them or inhibiting their growth. To this class belong calcium and potassium permanganate, hydrogen and sodium peroxide, which have been already mentioned; several inorganic acids, dilute sulphuric acid, dilute nitro-hydrochloric acid, and others; organic acids, as acetic acid, tartaric acid, citric acid; copper chloride, copper sulphate, acid bisulphate of soda, acid phosphate of soda, and sulphovinate of soda ($\text{NaC}_2\text{H}_3\text{SO}_4$). The most important substances belonging to this class are bromine, which has been investigated by Kratschmer, Jaworowski, Schumburg, Pfuhl, Huddleston, and Schüder, and chlorine, added in the form of chloride of lime, as suggested by Traube, Lode, Bassenge, and Ballner, or as sodium hypochlorite, as recommended by Sickenberger and Hünermann.

In this paper only the third class of substances will be considered.

The number of substances made use of strictly as disinfectants in the purification of drinking water is exceedingly great. Schumburg (*Veröffentlichungen auf dem Gebiete des Militär-Sanitätswesens*, Hft., 15, S. 34, 1897) has experimented with over twenty differ-

ent substances, and the results have in general been unfavorable. Many have but little action; others require too long a time for absolute sterilization, while others would render the water unfit for drinking on account of the nature or amount of the agent necessary. An agent to be of practical use for water disinfection must satisfy the following requirements: It must be a good disinfectant, rapid and powerful in action, easy to handle, and capable of transportation, especially if desired for use by troops on the march, without deterioration. It must be inexpensive, and the method of using it must leave the water wholesome and unaltered in appearance, odor, or taste. When these points are considered, the number of available substances becomes considerably reduced; and, in fact, it may be said that none of the proposed methods satisfy all of the above requirements. It is not to be expected of any method, however, that it should be active enough to make the contents of cesspools or puddles drinkable. All of the proposed methods are practically useless when the water to be disinfected contains fecal matter in large enough amount to cause color, turbidity, or a foul smell—in other words, in conditions in which the water would naturally be rejected without question. It is important that the limitations of the method in use be clearly understood and that its operation be confined within these limits. Such a method will find its chief use in cases where a water has become infected with typhoid, cholera, dysentery, or other pathogenic organisms, but which is otherwise a good drinking water, and occasions on which such a condition may occur are numerous. Schumburg suggests as notable instances barracks and camps in infected places, land and marine expeditions in the Tropics, for ships taking water in a suspected port, and generally in times of epidemics.

HYDROGEN PEROXIDE.

The use of this agent has already been referred to in considering the oxidizing substances used in the purification of drinking water. Van Hattinga and Tromp (*Waterstoffsuperoxyd ter Disinfection van Drinkwater*, Gronigen, 1887) recommends it as a suitable, cheap, and convenient substance for use in the disinfection of water. The method consists in adding a sufficient amount of hydrogen peroxide to the water to be disinfected and allowing it to stand for the required length of time. His results show that in order to sterilize water it is sufficient to add to it enough hydrogen peroxide to make a 1:10,000 solution and allow this to stand for twenty-four hours. The exact length of time required for sterilization depends upon the number of micro-organisms contained in the water. For a water containing 34,850 organisms per cubic centimeter, a 1:10,000 solution acting for twenty-four hours is sufficient. Cholera bacilli are killed in a 1:10,000 solution in five minutes, but typhoid bacilli require twenty-

four hours in a 1:5,000 solution. In these concentrations the taste of the water is not altered, nor is the water rendered unsafe or unfit for drinking purposes.

Uffelmann (*Jahresbericht über die Fortschritte und Leistungen auf dem Gebiete der Hygiene*, Jahrgang, 1888, 47) repeated the investigations of van Hattinga and Tromp and found that for the destruction of ordinary water bacteria 1:10,000, 1:5,000, and even 1:3,000 solutions of hydrogen peroxide are not always certain in action.

Altehoefer (*Centralblatt f. Bakt.*, 1890, VIII, 129) tested the disinfecting power of hydrogen peroxide in water. The required amount of the agent was added to the water to be sterilized, the mixture shaken, and then allowed to stand for twenty-four hours. Gelatin and agar plates were then made from the water so treated, and the results are stated by Altehoefer as follows: The following concentrations of hydrogen peroxide are sufficient:

1. For ordinary water bacteria, 1:1,000 after 24 hours.
2. For bacteria in canal water, 1:1,000 after 24 hours.
3. For pathogenic bacteria (cholera and typhoid), 1:1,000 after 24 hours.

It will be readily seen that the above method is without value in the practical disinfection of drinking water on account of the long time required.

COPPER CHLORIDE.

Kröhnke (*Chem. Ztg.*, XVII, 1893, Repet., 256) proposes copper chloride as the best substance for the complete and certain sterilization of water. Water treated with 1 part to 50,000 of this salt becomes germ-free in 1 hour; with 1:250,000, in 1 to 3 hours; with 1 to 500,000, in 8 hours, and with 1:1,000,000 in 24 hours. The cost is only 0.03 to 0.08 pf. for one liter. The copper chloride is thoroughly mixed with the water, and after having been allowed to act is precipitated with calcium carbonate. Filtration is necessary after this process. The author recommends his method as the most certain and practical and also the cheapest. It can be easily understood, however, that the length of time required and the subsequent filtration necessary render it useless for practical purposes.

ACIDS.

Various organic acids have been suggested as safe and efficient means of sterilizing water for drinking purposes. Among the more important of these are tartaric acid, citric acid, and acetic acid. Plagge (*Veröffent. a. d. Gebiete d. Mil. Sanitäts-Wesens*, 1895, H. 9, 185) states that the addition of 4 c. c. of 6 per cent vinegar to 100 c. c. water (= 0.24 per cent acetic acid in water), after having been allowed to act for two hours, caused a reduction of bacteria in Spree water from 2,500 per c. c. to 40–60, a reduction of typhoid bacilli from 2,000,000 to 5,000, and a destruction of 3,500,000 cholera germs. The typhoid bacilli were all

killed after 24 hours. Kitasato (Zeit. f. Hyg., 1888, III, 204) places the limits of the action of acetic acid on cholera bacilli at 0.2 per cent.

Parkes and Rideal (Lancet, 1901, I, 234) have experimented with the dilute mineral acids, dilute sulphuric acid (B. P.), and dilute nitrohydrochloric acid (B. P.), and the organic acids, citric and tartaric acid, which are largely used in the manufacture of lemonade. Other substances which they have experimented with are acid bisulphate of soda, acid phosphate of soda, and sulphovinate of soda ($\text{NaC}_2\text{H}_3\text{SO}_4$). All of these are substances to which the human system is tolerant, and the authors state that in the proportions which they have found to be necessary to inhibit the growth and activity of the typhoid bacillus they are quite palatable. They impart to the disinfected water a slight acid flavor, which is not disagreeable to the taste and which materially aids in quenching thirst. From their experiments with the above-mentioned substances Parkes and Rideal conclude that of the dilute acids, nitrohydrochloric and sulphuric, the former appears to be more efficient than the latter. They explain this difference by the fact that there is likely to be in nitrohydrochloric acid a small amount of free chlorine, which substance, as is well known, has powerful disinfectant properties. Further experiments with these substances were not made, since the object of their investigations was to find some method of disinfecting drinking water which could be made use of by soldiers in the field, and it was considered that a substance to be carried by individual soldiers should be a solid made up into small tablets, and not a liquid, which would have to be carried in a bottle and measured out with care when required for use. According to their results, citric and tartaric acids to be efficient must contain at least three times the amount of acid, as measured by decinormal soda solution, as is sufficient for nitrohydrochloric and sulphuric acids. Acid sodium phosphate and sodium sulphovinate were shown to be inefficient.

They recommend the use of sodium bisulphate during a campaign in the form of 5-grain tablets. The method suggested is as follows: The tablets should be capable of dissolving quickly in water, and for this reason a minimum amount of adhesive substance should be used in their manufacture. They should be put up in well-made, light, metallic boxes, each holding about 350 tablets, enough to sterilize over 100 pints of water at three tablets per pint. One of these boxes should be carried by each soldier. Supposing a soldier consumes 5 pints of water per day, the box of tablets will suffice for nearly three weeks. The dissolved tablet should remain in the water for at least fifteen minutes before being used. It is stated that the soda tablet renders the water much more effective in slaking thirst, and the soldier is therefore less liable to drink large quantities of water. The tablets may also be used as "thirst lozenges" when water is scarce.

According to the above authors, Braithwaite in July, 1897, suggested the use of a mixture of bromide and bromate added to the water in the form of a tablet, to be followed by a tablet of acid sulphate of soda or potash. A similar mixture is sold under the name of "bromidine." The quantity of bromine recommended was that obtained from 2 grains of bromide, or about 1 grain per quart, which gives only about 1 part in 17,500 of water. This quantity is much smaller than that recommended by other authors for sterilization. They state that about 1 part in 2,000 seems to be a safe quantity to use, which is nine times the amount suggested above, and this would render the amount of bromide remaining in the water rather too high for use for drinking purposes.

In general it may be stated that none of the above methods have been sufficiently tested to enable one to form an exact opinion as to their value, and until their results have been confirmed by other investigators it would seem that the practical value of the method proposed by Parkes and Rideal is open to question. As already stated, in order that an agent may be of practical value in the disinfection of water it must be capable of being depended upon absolutely within certain definite limits, and this can hardly be said to be the case with the bisulphate of soda method. Its action may be beneficial, but it can hardly be said to be absolutely certain. The method of investigation employed by Parkes and Rideal is also open to question, as will be brought out later in considering Schumburg's bromine method and Hünemann's hypochlorite of lime disinfection process, and the results which they obtained may be misleading.

IODINE.

For many years the halogens, both as elements and in their various compounds, have been recognized as powerful disinfectants, and many references to them are found in the literature from the time of Koch's first disinfection experiments to the present time. A great number of investigations have been devoted to their use in the purification of waste water, disinfection of instruments, dressings, etc., and to a small extent in the sterilization of water for drinking purposes.

Tincture of iodine was employed for the sterilization of drinking water by Mellièr (Repert. d. Pharm., 1895, 5), and according to his investigations 4 drops are sufficient to destroy all the pathogenic bacteria in a liter of spring water.

Schumburg (Veröff. a. d. Geb. d. Mil. Sanitäts-Wes., 1900, H. 15) added to a liter of Spree water 1 to 8 drops of a 1:2,000 Lugol's solution, and tested the water at the end of 5, 10, 20, 40, and 60 minutes, without favorable results, nor was he more successful when 10 to 30 drops of the solution were employed. They were somewhat better, but not invariably positive, with 3.5 c. c. He also tested the alcoholic tincture of iodine, but

obtained much less favorable results than those reported by Melliére. He succeeded in complete sterilization only after the use of 18 drops acting for one hour; 1.5 c. c. of the tincture gave a positive result in 5 to 10 minutes. He concludes, therefore, that iodine is of no value in the practical sterilization of drinking water.

Kaess (Pharm. Ztg., 1900, XLIX, 471) employed in his investigations strongly polluted rain and river water, and in part sterilized water, to which he added cultures of *b. coli*, *b. typhi*, and *v. cholerae*. The addition of 10 drops of tincture of iodine or Lugol's solution to 1 liter of the above-named waters was sufficient to cause destruction of all the above organisms in 10 minutes, with the exception of the typhoid bacillus.

CHLORINE.

Karlinski in 1894 (Wien. klin. Woch., 1894, 915) published the fact that 1 mg. free chlorine per liter of water is sufficient to destroy all water bacteria and the cholera and typhoid organisms, and that by a combination of chlorine with a filtration process a polluted and infected water can be made so wholesome that the greatest demands as to its harmlessness are satisfied. Kratschmer in 1894 (according to Schumburg, Veröff. a. d. Gebiete des Mil. Sanitäts-Wesens, H. 15, 79) showed that 3 mg. chlorine per liter of water killed anthrax spores.

Traube (Zeit. f. Hyg., 1894, XVI, 149) states that chloride of lime added to water rich in bacteria in the small amount of 0.000426 grams (equivalent to 0.0001065 grams available chlorine) to 100 c. c. of water kills all the contained organisms within two hours. The excess of chlorine is removed by Traube with 0.000209 grams of sodium sulphite. An excess of sodium sulphite even to the extent of 50 per cent more than the required amount is harmless, for in 12 to 14 hours it is changed to the sulphate by oxidation. The surplus of sodium sulphate so formed is so insignificant as to give rise to no unfavorable result or to alter the taste of the water. The reaction of water so treated remains neutral. The hardness is increased only to a small extent, and the amount of sulphates is not especially increased.

In his experiments he added to tap water a sufficient amount of fluid expressed from putrefying meat to make a mixture containing 0.2 gram of organic matter to the liter. The fluid was obtained from a quarter of a pound of chopped meat treated with a little water and kept in a warm place for 8 days. After remaining in the water for 2 hours the amount of calcium chloride was investigated, the results showing that it had decreased only 9.1 per cent. During the same time the organic matter had decreased only slightly in amount, thus showing that the calcium chloride acted upon the bacteria sooner than upon the other organic matter.

Traube states that by this means one can obtain sterile water in large amounts with ease at a low cost and in a

short space of time without having added any foreign substance to the water. He thinks from the researches of Koch in regard to the disinfecting power of chlorine that similar results would have been obtained had pathogenic bacteria been added to the water instead of saprophytic organisms.

Lode, in 1895 (Arch. f. Hyg., XXIV, 236), tested Traube's method. He employed in his experiments both natural and artificially polluted waters, adding to the latter *B. coli*, *B. typhi*, *B. anthracis*, and *B. cholerae*. He found the amount of free chlorine used by Traube (1 mg. per liter) to be insufficient to work in a short time, or even after 24 hours, and he therefore increased the amount 30 times (30 mg. per liter), and thus shortened the time required to 10 minutes, which is of much practical importance. The excess of chlorine he took up with calcium or sodium sulphite. He refers to the diminution in power of chloride of lime on standing, and the difficulty of dissolving it in water. The latter drawback he sought to obviate by grinding it finely in water, and also by the addition of 0.25 gram per liter of citric acid to aid in decomposing the chloride of lime. He did not obtain a clear water by this process, on account of suspended floccules of calcium carbonate, and, in view of a subsequent filtration, added hydrochloric acid.

Bassenge (Zeit. f. Hyg., XX, 227) made a large number of investigations with a view to their practical application in the chemical disinfection of drinking water, endeavoring by his experiments to answer the following questions:

(1) Is it possible to sterilize a water polluted with pathogenic organisms within a short time (not greater than 15 minutes) by the addition of a small amount of chloride of lime, without making the water unfit for human consumption?

(2) Does the water have any abnormal taste after the neutralization of the excess of chlorine with calcium bisulphite, and is the water, after being so treated, unwholesome?

(3) Is the method suited to practical application, and for what purposes in particular?

He found that it was possible to destroy with certainty the organisms in a liter of badly infected water in 12 minutes with 0.0652 gram of available chlorine per liter, and in 10 minutes with 0.0978 gram. For two hours' action 0.0108 gram of chlorine is sufficient. The chlorine not used for disinfection is reduced by calcium bisulphite, whereupon a small amount of calcium sulphate is thrown down as a precipitate. The water so treated is not harmful, the taste is not altered, and it can be used for a long time without any harmful influence upon the health of the consumer. It can be easily told by the taste and odor whether or not all of the free chlorine has been removed. The application of the method is very simple. As much chloride of lime as can be held on the point of a knife (about 1 gram) is

added to 5 liters of water, which is then strongly shaken and allowed to stand for 12 to 15 minutes. Then there is added, drop by drop, calcium bisulphite until the taste and odor of chlorine is no longer perceptible. Tablets might also be made containing the exact amount of the substances necessary for one liter of water, so that the method could be used by anyone. The method is of practical value in securing sterile drinking water for the use of troops, both in quarters and on the march, and for marine and land expeditions.

Bassenge repeated Traube's experiments, since the results which he obtained did not correspond to those obtained by Traube. To 100 c. c. of sterilized tap water was added 0.2 c. c. of a bouillon suspension made from a 48-hour typhoid culture on agar. Control plates made from the water so treated showed the presence of large numbers of bacteria to the cubic centimeter, and in control tubes the typhoid bacillus was found in pure culture. The infected water was then treated, exactly according to Traube's method, with 0.000108 gram of free chlorine—that is, by the addition of 0.3 c. c. of a 0.01 per cent solution. The excess of chlorine was neutralized with 0.008 gram calcium bisulphite, and the time allowed for action was 1, 1½, 2, 3, 4, and 8 hours, respectively. At the expiration of the time allowed, and after neutralization with the necessary amount of calcium bisulphite, 1 c. c. of the water was transferred to a gelatin plate and a similar amount to a tube of sterile bouillon. In no case was a sterilization of the water effected. In a subsequent series of experiments Bassenge found that it was necessary to use 0.00108 gram of free chlorine to 100 c. c. of water in order to render it sterile—an amount ten times as great as that recommended by Traube.

Bassenge states the results of his investigations as follows:

(1) The addition of 0.0978 gram of active chlorine to the liter of water which is strongly polluted with pathogenic bacteria (this amount of chlorine corresponding to about 0.15 gram commercial chloride of lime) is sufficient to render it germ-free in 10 minutes. For a longer time of action less chloride of lime is required—for example, for two hours, 0.0108 gram.

(2) The excess of chlorine can be reduced by calcium bisulphite, whereupon a small amount of calcium sulphate is thrown down as a precipitate. The water so treated is wholesome, and its taste and hardness is not altered to any extent. It can be used for a long time without any influence on the health, since chemically the water is not different from a natural water.

(3) It does not require a chemical test to tell whether all the chlorine has been neutralized. The same can easily be discovered by the taste and odor.

(4) This method of chemical disinfection of drinking water is simple to use and has a definite practical value.

Schumburg (Veröff. a. d. Gebiete d. Mil. Sanitäts-Wesens, H. 15, 83, 1897) acknowledges that the method

devised by Traube, and especially as developed by Bassenge, is accurate and sure in its operation; and states that Löffler (Weyl's Handb. f. Hyg., Jena, 1896, 709) considers Traube's method to have been demonstrated as of practical value; and also says that Ballner (Wien med. Woch., 1901, B. 31 and 33), by his investigations in 1901, confirmed the value of the chloride-of-lime method.

Sickenberger and Kaufmann (Chem. Ztg., XIV, 35) recommend the use of sodium hypochlorite as a valuable agent for the disinfection of drinking water in times of epidemics. They use enough of this substance to give to the water to be disinfected an available chlorine content of 2 mg. per liter. Kaufmann has by this method succeeded in sterilizing Nile water. Such water, containing 0.55 gram of mud to the liter, and which was turbid when unfiltered, showed in 1 c. c. 3,800 colonies, and this number was reduced to 125 by the use of sodium hypochlorite to the extent of 2 mg. available chlorine to the liter. Nile water, after being passed through sand filters—as used by the Egyptians for drinking water—showed before the use of the sodium hypochlorite 1,600 germs per c. c.; but after the use of the same, only 120. Of over 10,000,000 cholera germs in one-half liter of Nile water treated by this method, none of them showed any power of development upon being transferred to culture media. Five milligrams available chlorine to the liter of unfiltered Nile water killed all the organisms in 5 minutes.

Bassenge (Zeit. f. Hyg., XX, 227) also tested the method of Sickenberger and Kaufmann. Water infected with the cholera vibrio was treated with 0.0026 gram free chlorine to the liter, as recommended by the authors. The time of action allowed was 5 minutes, after which the chlorine was rendered inert by the use of calcium bisulphite. A cubic centimeter of the water added to a gelatin plate developed countless colonies. The same would also have held good with the typhoid bacillus, on account of its much greater resistance. The results of 33 investigations showed that if gelatin plates were depended upon as a measure of the number of organisms yet remaining capable of development, the method seemed apparently successful, but the results were quite the opposite when cultures were made from the disinfected water upon bouillon. In fact, it required the presence of 0.0652 per cent of free chlorine, acting for 5 minutes, to accomplish sterilization of the water—an amount twenty times as great as that recommended by Sickenberger and Kaufmann.

Hünemann and Deiter (Deut. med. Woch., 1901, 391) studied the question of the disinfection of drinking water by means of chlorine in the form of the hypochlorite of sodium. Hünemann states that he was able to destroy with certainty in 10 minutes all of the typhoid and cholera organisms contained in a liter of water by the addition of as much sodium hypochlorite as is equivalent to 0.04 gram of free chlorine. The

easy solubility of the sodium hypochlorite in water renders it a much more powerful disinfectant than the chloride of lime, which is less readily soluble. Hünemann used both fluid and solid media in his investigations, and also made special investigations as to the suitability of various culture media for different organisms. The hardness of the water and the amount of contained organic matter is not influenced to any extent by the disinfection process. The method is not so successful in water strongly polluted with urine or stools, but such water would not be used for drinking purposes in any event.

For the removal of the excess of chlorine after the action is complete, Hünemann uses sodium sulphite (Na_2SO_3), 0.14 gram of which is sufficient for 0.04 gram of chlorine. The end products remaining in the disinfected water are sodium chloride and sodium sulphate in small amounts, not enough to be injurious to the person drinking the water. The disinfected water is not noticeably changed in appearance, taste, or odor, nor is its hardness affected to any extent. The application of the method is so simple that anyone can use it. It finds its chief use in the household in times of epidemic, for troops in the field, for ships, and for expeditions into unhealthy places. By this method an infected water can be made quickly sterile for drinking purposes.

The solution of sodium hypochlorite at first used was that known as Eau de Javelle, or Eau de Labarraque. The content of active chlorine, however, in this solution is between 0.5 and 0.6 per cent—an amount too small to be used to the best advantage in military camps. A solution was therefore prepared by a special process containing 15 per cent of active chlorine. This solution is best transported in small, brown-colored, well-stoppered flasks. The glass stoppers, in order to prevent the entrance of air, are sealed with india-rubber plaster extending down onto the neck of the flask. Hypochlorite solution in such flasks will keep for weeks without a diminution in the amount of active chlorine. Sodium sulphite dissolves easily in water when powdered. It is best carried in glass tubes or gelatin capsules or in a concentrated solution. In the disinfection of water, ordinary vessels are to be avoided, since the chlorine attacks most of them. Glass vessels are the best. Ordinary cooking vessels may be used if free from rust. If rust be present, the chlorine readily unites with it and so loses some of its disinfecting power. Aluminum vessels are attacked by the sodium hypochlorite solution, but the amount of aluminum entering into the water in the space of 15 minutes is so small that it may be disregarded. Copper vessels are also attacked, and should therefore not be used. If the water to be disinfected contains urine or urinary products, 40 mg. of chlorine is not sufficient. Water containing 10 per cent of urine, to which was added 40 mg. of active chlorine, after 5 minutes showed

only 8 mg. active chlorine, and after 25 minutes no chlorine could be detected.

The amount of sodium chloride added to a liter of water by the employment of this method of water disinfection is 0.08 gram and of sodium sulphate 0.17 gram, and of these two salts only the last one can give any occasion for hesitation, but the amount is so small that harmful action is not to be expected. The cost of the method is only 0.04 pfennig to the liter of water to be disinfected.

Rabs (Hyg. Rundschau, 1901, XI, p. 1085) criticises the chloride of lime method especially on account of the slow solubility of the agent and on account of its causing a precipitate of calcium hydrate in the water, and also because the chlorine content of chloride of lime is always uncertain and tends to become less when kept for any length of time. Sodium hypochlorite, on the other hand, contains a higher percentage of chlorine. Rabs undertook a series of comparison tests with chloride of lime and sodium hypochlorite for the disinfection of drinking water. Twenty-four-hour agar cultures of typhoid, colon, and cholera organisms were added to tap and river water which had been previously sterilized, in the proportion of one culture to 100 c.c. of the water. Strongly polluted river water was also used without being sterilized and without the addition of any pathogenic organism.

The method of testing the value of the methods was as follows: To small flasks containing 100 c.c. of the infected water there was added the required amount of the chloride of lime solution (0.015 gram) and of sodium hypochlorite (0.004 gram), respectively. A small amount of dilute hydrochloric acid was added and the mixture shaken and allowed to stand for 10 minutes. The odor of chlorine became immediately apparent upon the addition of the acid. At the expiration of 10 minutes the excess of chlorine was neutralized with the necessary amount sodium sulphite and then three loopfuls of the disinfected water were transferred to agar plates and three loopfuls to tubes of sterile bouillon. Both plates and tubes were then kept for 8 days at 37° . By these investigations the statements of Lode and Hünemann were corroborated.

The results were quite different, however, when instead of the above method, the procedure recommended by Schüder was employed. This, in brief, consists of the investigation of the entire amount of the disinfected water by adding to it a sufficient amount of a concentrated pepton-salt solution to make of it a 1 per cent pepton-salt culture medium. This is then grown for 24 hours in the incubator, at the end of which time, if any organisms have survived the disinfection process, they will have multiplied and can be recognized by appropriate tests. When this method was used, both chloride of lime and Eau de Labarraque gave unfavorable results in 10 minutes.

On account of these unfavorable results the author

made a series of experiments giving a longer time of action, namely, 30 minutes. In this case both chloride of lime and sodium hypochlorite destroyed both cholera and typhoid organisms. He states, therefore, that to be absolutely certain in action both hypochlorite of sodium and chloride of lime, when employed in the amounts named must be allowed a duration of action of at least 30 minutes. In many cases this length of time may not even be sufficient, because of the low chlorine content of many preparations of chloride of lime and sodium hypochlorite.

Schüder (*Zeit. f. Hyg.*, 1902, XXXIX, p. 379) tested Hünemann's method, using a 10 per cent solution of sodium hypochlorite, (NaOCl) the chlorine content of which had been determined in the laboratory. For neutralizing the chlorine after it had been allowed to operate, a solution of sodium sulphite (Na_2SO_3) was made use of. In each case it was determined chemically whether or not there was any chlorine remaining in the disinfected water which by transference to the plates could inhibit the growth of the organisms. If this was found it was neutralized with more of the sodium sulphite solution. All of the experiments were carried out in well-stoppered flasks, and these were well shaken during the investigation in order to mix the chlorine thoroughly with all parts of the water to be disinfected. In all cases as favorable conditions for the investigation were brought about as would be likely to be the case in the use of the method in actual practice.

The water to be investigated was obtained from different sources, and varied in degrees of hardness and in the amount of contained organic matter. The following waters were made use of in the investigations: (1) Distilled water; (2) well water; (3) tap water, and (4) water from the ship canal. Sterilization by means of chlorine was sought to be determined (1) without the addition of any pathogenic organism; (2) after the addition of the cholera vibrio; (3) after the addition of typhoid bacilli, and (4) after the addition of dysentery bacilli. In the last three cases 24 hour incubator cultures on agar were employed. All the cultures were carefully washed off and then thoroughly mixed with the water to be infected by vigorous shaking for a considerable time, so that only the finest particles could be seen by the unaided eye. In general there was added small amounts of pathogenic bacteria, as was done by the author in his tests of Schumburg's method. The germ suspension was not filtered, as the author states, because this would not be the condition found in the practical application of the method. The water to be disinfected, if contaminated at all, would in nearly every case be contaminated with the dejections of typhoid or cholera patients, and the germs contained in such water would be more or less aggregated in groups or clumps, and not finely divided, as if they had been passed through a filter paper.

The sodium sulphite solution, designed to take up the excess of chlorine after the action of the hypochlorite solution was completed, was not sterilized, since it was found that this solution remained germ free. Sterile pipettes were used in adding this to the first solution; hence there was no fear of its contamination. Each separate investigation was repeated. Schüder states in regard to his method: "I do not believe I am going too far when I express the fear, based upon the following investigations, that neither the Hünemann nor the other methods for the disinfection of drinking water by means of chlorine appear to be, in the first place, certain in the absolute destruction of bacteria, and a definite indication of their practical value can only be obtained by the method outlined below. The more favorable results obtained by other investigators, it seems to me, are dependent on the inefficient methods employed. Two errors are apparent—one made in all cases—that too few investigations are made of the water after its disinfection, and, second, that a number of investigators work invariably with solid media in the investigation of the organisms remaining capable of development."

As a result of his researches with water to which no pathogenic germs had been added, Schüder shows that Hünemann's method appears to be fairly successful, destroying apparently all of the bacilli in 8 out of 16 cases. In all cases 10 c. c. of the water was examined for the presence of organisms capable of development after disinfection by Hünemann's process. In the cases in which the gelatin plates were not found to be sterile after the treatment the reduction in the number of organisms was very great (from 4,870,000 to 18 in one case, and from 3,928,000 to 1 in another).

In his researches with water to which the cholera vibrio had been added, in nine times out of twenty-eight the plates were found to be sterile after the solution had been allowed to act for 10 minutes. The separate experiments were all repeated, and only twice did both the first and the second trial give a positive result. In other cases where one investigation was positive, its repetition was negative. In the cases in which the result was positive both the first and second times, the water used in the experiment was distilled water. The results, therefore, with the water to which the cholera vibrio was added were not so favorable as when it is used in water to which no pathogenic organisms have been added. Schüder explains that this may possibly be due to the fact that the organisms were added in the form of a suspension and perhaps were not so finely divided as they would be in the first case, and also because in the first case the ordinary plate method was used to determine the number of germs remaining in only 10 c. c. of the water, while in the second set of experiments the entire amount of the disinfected water was investigated. In order to determine whether the action upon the cholera vibrio would be greater if the

organisms were more finely separated, he added to water a suspension of an agar culture of the cholera organism after it had been passed through a filter paper. He remarks, however, that this would not be a parallel case to contaminated water as found in nature, since such water is apt to be polluted by cholera stools and the organisms would be in masses rather than finely separated. In this investigation the cholera vibrio was killed in only three out of eight cases, and in these cases the repetitions did not give the same result.

The method employed in the examination of the water for living organisms after treatment by Hünemann's method was the same as that employed by the author in his investigations of Schumburg's method of disinfecting drinking water with bromine. This is stated as follows (*Zeit. f. Hyg.*, XXXVII, p. 312): "For the determination of the presence of living cholera vibrios in the disinfected water, the 'pepton-enriching method' and the indol reaction are used. In the first experiments only the gelatin plate method was employed (Investigations 1 to 12, Table II). The method later employed, however, allows the entire amount of the water treated to be investigated for the presence of cholera organisms, and upon this point the greatest stress should be laid, as the investigations clearly show. In brief, the method is as follows: After the neutralization of the excess of bromine in the water by means of the dissolved tablet, a sufficient amount of saturated soda solution is added to the water to give to the media to be made from it a good alkaline reaction. The entire amount of water is then divided up among a number of small flasks, each holding from 100 to 200 c. c., and to each one is added a sufficient amount of a concentrated pepton-salt solution to form a 1 per cent pepton-salt culture media. The flasks are then kept for 24 hours at 37°, and then from the surface of each three platinum loopfuls are transferred to a tube containing also 1 per cent pepton-salt solution, which tubes are also kept for 24 hours at 37°. After this second transference has been effected the flasks are tried for the indol reaction, and if this is not found the corresponding tubes are tried on the next day. This precaution is important, for it has occurred several times in the author's experience that the indol reaction is first discovered in the tube. It soon proved itself to be better to divide the water for the 'enriching process' and the indol reaction into a number of small flasks rather than to make the investigation in one large flask. Of course, it is to be established by control tests that the water used in the experiments contains in itself no indol producer."

Schüder thought that the difference in the results between his first set of experiments, in which the natural water was used, and the second, in which cholera organisms were added to the water in suspensions of an agar culture, did not depend so much upon the kind of bacteria, as upon the method used in determining their

presence in the water after treatment, and consequently he made comparison tests of the gelatin-plate method and the "pepton-enriching method." He found that while the gelatin plates remained sterile, or at least showed only a few germs from the air, the "enriching method" showed in every case the presence of more or less cholera organisms capable of growth. He therefore concludes that the plate method ordinarily used is not satisfactory in determining the number of germs in the water after treatment, but that all of the water should be examined by the addition of concentrated pepton-salt solution, as described above. He thinks that this will explain the difference between his results and those of Schumburg and Pfuhl with bromine, as well as the difference in the amount of the water used in searching for the contained organisms after the use of the disinfection method. On account of this he repeated his first series of experiments with natural waters, and tested the water after disinfection both by the plate method and by the use of plates made from the water after the addition of pepton-salt solution and growth for 24 hours at 37°. The results in this case were parallel to those in the case of the cholera vibrio. Plates which showed no colonies by the ordinary method showed many colonies when made after the "enriching method" was used. Thus water, shown by the ordinary plate method to be apparently germ free, in reality contained organisms capable of development. The results of these experiments cause those first made with the natural waters and the gelatin-plate method to appear in a different light, and raise a question as to whether there was as great a reduction in the bacterial content of the tested water as was indicated in the first experiments.

The results with water to which typhoid bacilli had been added were much the same as those obtained by the use of cholera germs. The water to be infected was first carefully sterilized, in order to make the subsequent recognition of the typhoid germ easy. The agglutination reaction with a dilution of 1:100 served for the recognition of the typhoid colonies. For the first 8 investigations only agar plates were used in determining the number of organisms remaining alive, but as these showed only a very small number—some of them none—in the next series (from 9 to 16) the "pepton-enriching method" was employed, after which agar plates were made. In the rest of the experiments instead of the ordinary agar plates, plates of Drigalski's medium were used. On this medium the typhoid colonies can be recognized macroscopically. In these cases, however, the agglutination test was also used. The investigations show, besides the fact that the method is not of value in water infected with the typhoid bacillus, that the ordinary plate method does not give exact results in this class of investigations.

The results of the experiments with the dysentery bacillus are analogous to those of the preceding experi-

ments. Water was sterilized and infected with the dysentery bacillus, and the ordinary plate method, using 10 c. c. of the disinfected water, was employed, as well as the "pepton-enriching method," after which plates were made on a special media for the dysentery bacillus. The agglutination test was also used. The dysentery bacillus was not invariably destroyed. Although the plate method indicated that the water after treatment was sterile, the "pepton-enriching method" showed the presence of numerous organisms capable of development in 7 cases out of 8.

Schüder claims that the increase in the number of bacteria in the water after 24 hours when the "enriching method" is employed is not sufficient to account for the discrepancy between the results obtained by this and by the ordinary plate method. The most probable explanation, according to Schüder, is that the disinfecting substance added to the water, and also perhaps the neutralizing substance, by being taken up and retained by the bacteria, lessens their power of development; but when they are transferred to a medium containing a large amount of water, this substance is removed from the organisms by osmosis, which does not occur when solid media are used, or at least goes on so slowly that the power of development is not regained. The fact of the uncertainty of the ordinary plate method for the determination of organisms remaining alive after the disinfection experiments, as well as their number, is to be made especially prominent, and especially so on account of the use of the plate method in the studies of disinfectants.

As a result of his researches, Schüder is convinced that heretofore no method of investigation has been used which would with certainty determine the quantitative value of a disinfectant, and consequently the relative value remains uncertain, because, for all such researches the plate method is not satisfactory. At best it allows one to refer only to "organisms not capable of development on agar or gelatin," which, for practical purposes, is not sufficient; and besides, this method allows only small quantities of the material to be examined, except with great difficulty. It is only by the employment of liquid culture media, and by the "enriching method," before plating on solid media, and the use of large amounts, or all, of the material to be examined, that it can be determined whether a disinfectant has rendered all of the contained organisms incapable of development or not, and this is of the greatest importance in the determination of the practical value of such a substance.

Schüder states his conclusions as to the value of Hünemann's method of drinking-water disinfection as follows:

1. The use of the method seems to decrease the bacterial content of very impure waters and water rich in bacteria, and in some cases may make the same germ free.

2. In some cases the method destroys cholera germs with certainty, but these are the exception. Usually one finds only a very slight diminution in the number.

3. Typhoid bacilli are not invariably destroyed, and in many cases no bactericidal action is apparent.

4. Filtered culture suspensions of cholera and typhoid organisms, when added to the water to be disinfected, are not affected with certainty by this method.

5. Dysentery bacilli are not always destroyed, in spite of the fact that they have hitherto seemed to be the most easily destroyed of all the pathogenic micro-organisms.

6. Hünemann's method seems on the whole to exercise a greater destructive action than Schumburg's bromine method, especially against typhoid bacilli.

Whether a longer time of action of the chlorine solution, or a larger amount of the same, or both, would give more favorable results, must be shown by further investigation. The lengthening of the time of action to 20 minutes or longer would limit the usefulness of the method, however, and even a duration of 10 minutes is quite long for practical purposes.

The great difference between Hünemann's and Schüder's results finds its explanation, according to Schüder, in the different methods employed, and in part, because Hünemann worked with filtered culture suspensions of the germs. Hünemann has been led astray in his researches in the same manner as Schumburg and Pfuhl in their studies of bromine, in the first place, by the use of too small amounts of the material and also by the uncertainties of the ordinary plate method.

Schüder gives the following as the demands which must be satisfied, in his opinion, in these and similar investigations, in order that they may be free from objection:

1. The plate methods heretofore used (agar, gelatin) will only give a result free from objection when they do not remain sterile—that is, when the micro-organisms sought for are found on the plates. Plates should be made with at least 10 c. c. of the material to be tested, or even with a greater amount.

2. If the plates are not sterile one can not, from the number of the colonies which develop, come to a conclusion as to the number of organisms destroyed, because such plates might yet contain a great number of injured organisms, yet capable of development under proper conditions. Neither can the proportionate reducing action be determined.

3. If the plates remain sterile it is necessary to use in every case (^a) the corresponding "enriching method" before the plating, and (^b) when possible, to use the entire amount of the water to be investigated.

4. In investigations with the cholera vibrio the "enriching method" is very easy to carry out, because instead of the plate method the cholera indol reaction can be applied directly, and it is not necessary to have the water sterilized before adding the cholera vibrios.

to it. It has only to be determined by a control test that the water previously contains no indol producer.

5. For typhoid and dysentery bacilli the "enriching method" can be carried out without a great amount of trouble, since the exclusion of other germs is insured by sterilization of the water to be investigated. The special culture media mentioned make the subsequent plating easier. It is appropriate in the "enriching method" to divide the water to be examined among a number of small flasks, in order to obtain a better judgment as to the effectiveness of the sterilization.

6. When other bacteria are to be investigated the method must suit the circumstances.

7. Every investigation must be repeated.

In conclusion, Schüder expresses the opinion that possibly substances heretofore considered as good disinfectants in the concentration and time of action heretofore allowed, when tested in the manner herein recommended may prove to be less reliable than is generally believed—a fact which is of practical importance and far-reaching significance. Researches in this direction would be of the greatest value, for example, in regard to the use of chloride of lime in water purification, which heretofore has been considered a satisfactory disinfectant for drinking water and also as a disinfectant for bathing water infected with typhoid bacilli, for which purpose it has been considered as an easily employed, cheap, harmless, and certain disinfectant.

Engel (Centralblatt f. Bakt., XXXII, 495) investigated Traube's process for the chemical disinfection of drinking water by means of chloride of lime. He employed four different kinds of water containing ordinary water bacteria and also cultures of typhoid and cholera organisms.

In the first investigation the author followed the method recommended by Lode, and used for the investigation of its bacterial content only 2 c. c. of the disinfected water. The results were in this case favorable and similar to those reported by Traube and Lode.

The results, however, were otherwise when the entire amount of water disinfected was examined by adding to it a sufficient amount of concentrated pepton-salt solution to make from the water a 1 per cent pepton-salt solution media, and this allowed to develop for 8 days at 37°. After this "enriching method" had been employed for the given time, gelatin plates were made, using 2 c. c. of the 1 per cent culture media. In 15 investigations with tap and river water, using 34 mg. of chlorine to the liter, it was sterilized in only 4 cases, the time allowed being 15, 40, and 60 minutes, respectively. In the experiments with water to which cholera organisms were added, using 34 mg. chlorine to the liter, the complete destruction of the organisms was accomplished in only 10 cases out of 19, three times in 5 minutes, five times in 10 minutes, and twice in 30 minutes. The same unfavorable results occurred when the cultures added to the water were first passed

through double filter paper in order to remove zoogloea and gross particles of the culture medium.

In the third investigation the author attempted to find out how much chloride of lime was necessary to completely disinfect the water in 10 minutes, following Schüder's method. He found that it required 0.45 gram of chloride of lime to the liter (corresponding to 106 mg. chlorine), which is three times as much as Lode states is necessary and 100 times as much as the amount recommended by Traube.

Schumburg (Veröff aus dem Gebiete des Militär Sanitäts-Wesens, 1900, H. 15) reports, after a year's laboratory work on the chemical disinfection of drinking water, that the method which he has found the most easily applicable and the most successful is by the use of bromine, which, after being allowed to act for 5 minutes, is rendered inert by the addition of ammonia, and a clear and tasteless water results. The amount of bromine necessary for this purpose is very small. Schumburg found that 0.06 gram is sufficient for 1 liter of water. The bromine is best used in the form of a bromine in potassium bromide solution, after the form of Lugol's solution, and is composed as follows: Water, 100; bromine, 20, and potassium bromide, 20. Of this solution 0.2 c. c. is sufficient to sterilize 1 liter of Spree water in 5 minutes. In attempting to sterilize very impure river and swamp water some of the bromine is neutralized by the lime and ammonia contained in them, and enough bromine must be added to give the water a light yellow color for half a minute. For neutralizing the 0.2 c. c. of the bromine solution the same amount of 9 per cent ammonia is sufficient. If more than 0.2 c. c. of the bromine solution has been employed, a corresponding amount of the ammonia must be used. The taste of the water so treated is scarcely altered, and in color it remains absolutely clear. The amount of bromine salt remaining in the water (about 0.15 gram to the liter) is so small as to be without influence upon the taste of the water or upon the health of the one using it. One kilogram of bromine is sufficient for 16,000 liters of water. Schumburg's experiments with water infected with cholera and typhoid germs from different sources, with feces, and with many saprophytic organisms lead him to believe that the bromine method is the best adapted for the purpose of rendering an infected water suitable for drinking purposes in small amounts. He has had in mind in his researches the disinfection of water for troops in barracks or in the field; also for the use of ships when filling water tanks in suspected harbors; for household use in times of epidemics, and for the preparation of sterile water for the use of physicians and surgeons.

In a second paper Schumburg recommends that the bromine solution be made up as follows:

Potassium bromide	20.00
Bromine	21.91
Aq., q. s. ad	100.00

and for neutralizing the bromine after the same has been allowed to act for a sufficient time he recommends instead of ammonia a tablet made up as follows:

Sodium sulphite	0.05
Sodium carbonate, exsc.....	.04
Mannite .....	.025

This is to be dissolved in a little water and added to the water which has been treated with the bromine solution. One tablet is sufficient for 1 liter of water. He also confirms his previous statement that 0.06 gram of bromine to the liter of water is sufficient for ordinary cases.

Schumburg has devised a pouch for transportation on a military bicycle, consisting of a case of brown sail-cloth, the corners of which are made water-tight with strips of leather. It is 23 cm. long, 14 cm. high, and 9 cm. wide. It contains 6 tin boxes, (13×3×2 cm.) with mixers, 2 leather cases for 6 glass tubes, 7 cm. long. In each of the 6 tin boxes are carefully packed 2 sealed glass cylinders filled with concentrated bromine in potassium bromide solution (bromine, 21.91, potas. bromide, 20, and aq., ad 100). The sealed end of the cylinder is drawn out so that it may be easily broken. The 6 cylinders contain 22 cm. (27 grams) of the bromine solution, enough to kill the pathogenic bacteria in 100 liters of water. The instrument box contains a spatula for mixing the solution, and a measuring glass (10 c. c.) and a small tin handle for the easy management of the measuring glass. In the leather cases are 6 short thick-walled reagent glasses closed with cork. In each tube are 12 grams of powdered salt mixture (sodium sulphite, 0.095 gram; dry sodium carbonate, 0.04 gram, and mannite, 0.025 gram); which is sufficient to neutralize the bromine required for 100 liters of water. The weight of the entire case is 1.841 grams. Its contents are sufficient for the disinfection of 1,200 liters of water.

The use of this case is very simple, and may be explained as follows: The cyclist before mentioned, who carries the case, fills a graduated cooking vessel with 1 liter of water, breaks off the top of a bromine tube, places the end of the same under the surface of the water, and allows its contents to escape, which is accomplished in a short time. The water is then stirred with the spatula or a spoon. Then with the measuring glass 10 c. c. of this stock solution is given to each soldier, as he passes by carrying his graduated cooking vessel, into which he has placed 1 liter of the water to be disinfected. This mixture is well stirred and the bromine allowed to act for 5 minutes. Then follows the neutralization of the bromine by the addition of 10 c. c. of the second solution, which has also been mixed in a second cooking vessel, with a liter of water. Two minutes after the addition of the neutralizing salt solution to the individual receptacles, the disinfected water is ready for use.

Pfuhl (Zeit. f. Hyg., 1900, XXXIII, 53) has tested

Schumburg's method, and places it first among the various procedures for the chemical disinfection of drinking water. In his investigations Pfuhl worked with river, pond, and swamp water, instead of with distilled water, as has formerly been done. Water was obtained from 6 different sources, and to these samples were added cultures of cholera organisms, derived from different sources, typhoid bacilli, and the staphylococcus pyogenes aureus. In certain instances the cultures were not entirely destroyed, but Pfuhl attributes this to the severity of the test or to the small amount of bromine employed. It must in all cases be well mixed with the water, and the neutralizing salt must be dissolved in sterile water before being added to the water to be sterilized.

In the method given by Schumburg of making a stock solution of the bromine for distribution to a company of troops it requires some 8 or 10 minutes to exhaust the supply. As bromine is a very volatile substance, more must be used after it has been exposed for some time. By experiment it is shown that during the first 12 minutes the bromine content of such a solution falls from 0.683 gram free bromine to 0.2 c. c. of the solution to 0.045 gram free bromine to 0.24 c. c.; and in 4 hours to 0.041 gram. The loss of free bromine in the first 12 minutes, therefore, is 0.0233 gram (23 mg.), and in the next 4 hours there is lost only 0.004 gram. It follows from this that after the first 5 or 6 minutes a larger amount of the stock solution must be used to a liter of water.

(1) Pfuhl attributes the cases in which he was not able to destroy all the pathogenic germs in the water treated to the fact that some of the tests were unusually severe.

(2) It is necessary after the addition of the bromine to the water to stir the mixture thoroughly, since on account of the specific gravity of the bromine it is apt to sink to the bottom, leaving the upper layers of the water free from the disinfectant.

(3) The neutralizing solution should be dissolved in water which is free from objection. It is better that the salts be carried in the pulverized form than in tablets, as earlier recommended, since it is in this form much easier of solution. Distilled water is best for this purpose since after the solution of the salt it remains perfectly clear, while natural water, on account of its hardness, becomes somewhat milky.

(4) In cases where the chemical composition of the water is unknown, it is better to use more than 10 c. c. of the stock solution to the liter. Enough should be added to give to the water a yellow tinge for about 2 to 3 minutes. In general it may be said that the harder a water is and the richer in organic matter, the more bromine solution will it require for its disinfection.

(5) It is essential that the bromine in potassium bromide solution be carried in the sealed tubes in order to prevent the escape of the bromine before the use of

the solution. On account of its volatility it is important that the manufacture and use of the stock solution should take place as rapidly as possible, and after the fifth or sixth minute a larger amount of it must be used, 15 c.c., instead of 10 c.c., to the liter. As explained before, when the strength of the bromine solution falls to about 0.045 gram free bromine to 0.2 c.c. it remains practically constant; consequently for household use it may be well to make with the contents of 1 bromine tube 2 liters of the stock solution instead of 1, and then use a double portion of this (20 c.c.) to a liter of water.

(6) On account of the irritating action of bromine upon mucous membranes and its suffocating action, the preparation of the stock solution and its addition to the water should not be done in ordinary rooms, and the inspiration of the vapors should be avoided even when it is done in the open air.

(7) The taste of the water after treatment by the Schumburg process is, in comparison with that not treated, somewhat fresher, and slightly alkaline, like stale selzer water. The small quantity of contained bromides is without harmful action on the general health or the digestion, and may be used for a long time without danger.

Pfuhl also gives directions for the use of the case above described for military purposes, both in times of peace and in war, which may be stated in brief as follows:

Every infantry battalion, cavalry regiment, and artillery division receives a filled Schumburg pouch, and with it an accompanying reserve supply of chemicals, which is transported in a wagon. When the troop is encamped at a place supposed to be infected with some disease the officer in charge of the disinfection of water makes inquiries as to the source of drinking water, and collects a large number of vessels for its reception. Each man then fills his graduated cooking vessel with a liter of water. During this time the officer in charge, with the help of an assistant, prepares the bromine solution and the salt solution, each with a liter of water, in a vessel in the manner already described. The men then file past and each receives into his vessel containing the water to be disinfected the necessary amount of the stock solution. The attendant stirs the mixture vigorously and attends to it that the solution is allowed to work in each vessel for not less than 5 minutes. After 5 minutes the neutralization of the bromine is accomplished in the same way, and in 5 minutes more the water is ready for use. If more convenient, the sergeant and his attendant can pass along the front of the troops and give each man his portion of the stock solution. If it becomes necessary to sterilize the water more rapidly, as might be the case in forced marches and campaigns, a larger quantity of bromine and salt solution may be used.

If it is desired to purify the water contained in large receptacles it is necessary of course to know the amount of water to be treated in order to be able to

add the proper amount of bromine. One bromine tube is sufficient for 100 liters of water. The stirring of such a large amount of water must be carefully carried out, best with a long clean wooden paddle. After neutralization the disinfected water may then be distributed, or each man may dip it up for himself. For rapid work in preparing the solution the mixing glass should be capable of holding not less than 20 c. c. and should be graduated. It is also important that on the inner side of the cover of the pouch full instructions for using the method should be pasted.

This same method is useful on ships and in daily life as well as by troops. The method is so simple that it can be used successfully by an ordinary person. In most cases reagents for disinfection of 600 liters of water are sufficient. Such an amount is put up in two cases, with all reagents, mixing apparatus, etc. The bromine solution is contained in one case. The neutralizing salt is in the upper part of the case in glass tubes, carefully packed. Each bromine tube contains 10 c. c. of the concentrated bromine solution, sufficient for the disinfection of 50 liters of water. One tube of the neutralizing salt contains enough to neutralize 10 c. c. of the bromine solution. The second case contains a 500 c. c. mixing glass, two glass flasks, and an aluminum spoon. With this apparatus a single liter or a larger amount of water can be disinfected easily and quickly. A bromine tube is broken and mixed with 500 c. c. of water in the mixing glass, and then placed in one of the flasks and tightly corked. A neutralizing powder is mixed in the same way with 500 c. c. of water and placed in a second flask. The bromine and neutralizing salt contained in these flasks is sufficient for 50 liters of water. If it is desired to disinfect 1 liter of water, 10 c. c. of the bromine solution is removed from the flask with the aluminum spoon, mixed with the liter of water and thoroughly stirred, and allowed to stand for 5 minutes, after which a spoonful of the neutralizing salt is added, and in a few minutes the water is obtained free from objection. If it is desired to sterilize 50 liters of water one of the bromine tubes may be mixed directly with this amount, and one of the neutralizing powders added after the proper time.

Huddleston (Medical News, 1900, 1004) reports a series of experiments undertaken by himself in the chemical disinfection of drinking water by the use of Schumburg's method. Forty-eight-hour cultures of typhoid and colon bacilli were added to Croton River water, water from the Hudson River, and water from a stagnant pool. The time of exposure to the bromine solution varied from 5 to 7½ minutes. Hiss's tube media was made use of to determine the presence of typhoid and colon bacilli after the bromine solution had been used. The results were in accord with those of Schumburg and Pfuhl. The method was capable of making even stagnant water sterile if sufficient bromine were added.

Schüder (Zeit. f. Hyg., XXXVII, p. 307) has tested

the method suggested by Schumburg, but with unsatisfactory results. In 34 investigations with distilled water, tap water, well water, water from a ship canal, and from a puddle—in part of these the amount of bromine recommended by Schumburg was doubled and even trebled—he found all the bacteria destroyed in only 16 cases; and in 11 cases treated strictly according to Schumburg's process only 3 showed total destruction of the organisms. In this series the number of organisms both before and after disinfection were determined by means of the ordinary gelatin-plate method, 2 c. c. of the water being used to each plate. He found that in general, while the decrease in the number of the organisms after Schumburg's method had been employed was not inconsiderable, still in some cases in spite of a large amount of bromine and a long time of action, the bacterial content of the water was not very much reduced. Schumburg has also made the observation that some of the bacteria contained in Spree water seemed to have widely different resistance to the action of bromine. In the 16 cases in which the plates were found to be sterile no further investigations were made to determine whether the water in reality contained any organisms capable of development. That this might easily occur can be seen from the fact that out of 5 liters of water only 2 c. c. were used for each plate. It was therefore decided to adopt some other method of determining whether the water after treatment by the bromine method was ever made entirely germ free.

In the study of the action of bromine on the cholera organism, a suspension of a 24-hour incubator culture on agar was made and this was added to the water to be disinfected, and then thoroughly shaken. In a number of experiments only 1 to 3 loopfuls of the suspension was transferred to the water, after which the whole was thoroughly shaken in order to distribute the germs evenly through the water. The method employed in searching for living organisms in the water after it had been treated according to Schumburg's method was, in brief, as follows: After the action of the bromine has been inhibited by the addition of one of the tablets used for this purpose, dissolved in sterile water, enough of a saturated soda solution is added to give a distinct alkaline reaction to the pepton media subsequently to be prepared from the water. The entire amount of the water is placed in a number of small flasks, of 100 to 200 c. c. capacity, and to each one is added a sufficient amount of a concentrated pepton-salt solution to form with the water a 1 per cent pepton-salt media. The flasks are then kept for 24 hours at 37°, and at the end of this time 3 loopfuls are taken from the upper part of each of these and transferred to tubes which also contain a 1 per cent pepton-salt solution. These are also placed in the incubator at 37° for 24 hours. Immediately after this second transference each of the flasks is tested for the presence of indol, and if the test is not given by any one of the flasks, it is tried in the corresponding tube

on the following day. This procedure is important, since the author in several cases obtained the indol reaction in the tube when it did not appear in the flask. In this way also the entire amount of the water is examined. It is also important to previously determine by control tests that the water used in the experiment contains no indol-producing germ before the addition of the cholera bacillus.

The results of the tests with the cholera bacillus were unfavorable. Out of 59 tests the cholera vibrio was destroyed in only 11 cases. With the amount of bromine and the duration of action recommended by Schumburg, when an entire agar culture was added to the liter of water, the organisms were never totally destroyed, and in only 2 cases did this occur when only 1 loopful of the suspension was added to a liter of water. The organisms were destroyed in only 2 cases when a platinum loopful was added to 5 liters of the water to be tested. In all other cases it required a greater amount of bromine and a longer time of action to destroy the cholera germs. These results were not always absolutely certain, because in cases where the experiment was repeated it would sometimes be given one time positive and the next time negative. In some of the experiments even a double amount of the bromine allowed to act for twice the time recommended by Schumburg on water to which 1 loopful of the suspension had been added to 5 liters of the water was insufficient to destroy the cholera organism. His results show that out of many flasks examined for the cholera organisms they were often found in only a few of the same series, thus indicating that it is necessary to test the entire amount in order to be able to say that the water does not contain such organisms. He explains the discrepancy between his own results and those of Schumburg and Pfuhl by the fact that these authors used only small amounts of the water in searching for the remaining living organisms, and also because the cultures which they added to the water were suspensions which had been passed through filter paper, and consequently were in a finely divided condition—a condition which is not the case in nature, and for which conditions the method should be useful. Furthermore, Schüder applied his method to several cases in which the culture suspension had been passed through double filter paper before being added to the water to be examined, and in only 2 out of 8 cases were the organisms entirely destroyed. In one of these positive cases, also, a repetition gave a negative result. The results, therefore, even after filtered cultures were added to the water, are as unfavorable as those in which the cultures were not passed through filter paper. In these cases the time of action was five minutes, and the amount of bromine was doubled and even trebled.

In his third series of examinations typhoid bacilli were added to the water to be examined. Schumburg and Pfuhl, in their researches, determined the presence of typhoid organisms in the water by the ordinary plate

method, but this presents great difficulty on account of the typhoid-like colonies which are apt to be found on the plates made from water. On account of this, and because it would be impossible to identify the great number of colonies which would result from his method of investigating the entire amount of water disinfected, Schüder adopted the following method: The water to be infected, and afterwards disinfected, was placed in flasks and carefully sterilized and shown to be germ free. Then a suspension of a 24-hour agar culture grown at 37° was added to the sterile water. Whatever now appears on the plates after the use of the bromine method, provided the neutralizing tablet is dissolved in distilled water, will be typhoid bacilli. The suspension added to the water contained no particles visible to the unaided eye. Twenty-five tests were made, and in none of them were the typhoid bacilli entirely destroyed, notwithstanding the fact that the amount of bromine was increased to twice and even five times the amount recommended by Schumburg, and the time of action extended to 1 hour in 2 cases. In the last 2 tests five times the amount of bromine recommended by Schumburg was allowed to act for twelve times as long as he states is necessary for complete sterilization, but plates made at the end of this time showed numerous colonies. This "enriching method" was inserted before the plating. The same results were obtained with water to which filtered suspensions of the germ had been added. His conclusions are given as follows:

1. Schumburg's method of water disinfection by means of bromine does not serve well against cholera and typhoid bacteria, and therefore probably not against the other pathogenic bacteria found in water.

2. The investigations undertaken by Schumburg and Pfuhl for the testing of the method are, in Schüder's opinion, not convincing evidence, because—

- (a) The amount of water used to determine the destruction of the pathogenic organisms was much too small. Both Schumburg and Pfuhl made this error.

- (b) Because both investigators added to the water suspensions of germs which had been passed through filter paper, thus giving a condition which in practical work would scarcely be met with.

3. The bromine method considerably reduces the bacterial content of a very impure water, but it is doubtful if a very considerable reduction of typhoid and cholera germs occurs, and certainly not to the extent of making an infected water safe for drinking purposes.

4. The use of double filter paper before investigations of the bromine method renders the results worthless in a great number of cases.

Schumburg (*Zeit. f. Hyg.*, 1902, XXXIX, 511) answers Schüder's criticism in regard to the small amount of water examined by him for organisms capable of development after treatment with the bromine method and also in regard to the filtration of the suspensions of

pathogenic organisms added to the water. In regard to the small amount of water used in the investigation (as a rule, 3 c. c. from a liter of water) he states that since Koch's work in 1881 it has been customary for investigators to determine the presence or absence of germs in water by the use of at most a few cubic centimeters, and if 3 c. c. of such a water is found to be sterile the whole of the water is assumed to be sterile. This method, which has been used by hundreds of investigators, is now pronounced by Schüder to be faulty. If this is the case, then all of the studies on disinfection and disinfectants must be based upon incorrect methods. He asks, moreover, how would Schüder proceed to examine the entire amount of water if he were studying the action of the method on water which had been used for bathing a typhoid patient.

Schumburg thinks that the filtration of the culture suspension is necessary, because the surface of the small particles of the culture medium in the suspension become covered with a precipitated film of bromine albumin, which protects the deeper layers and the deeper-lying bacteria, so that when these are dissolved in the fluid medium the organisms are capable of development. In reality one finds ordinarily in water only free bacteria or only small clumps of 8 or 10 individuals. By "quickly improvised filters for the use of troops" Schumburg did not mean paper filters, such as would be used in the laboratory, but filters devised for straining out the pieces of wood, leaves, and the like which might be contained in the water as gross impurities. This filtration is for an entirely different purpose from the filtration of the culture suspension. The last is for the purpose of breaking up and removing zoöglæa contained in the suspension, while the quick filtration is directed only against gross contamination.

Schumburg is unable to explain why it is that Schüder failed to kill the cholera and typhoid organisms in water with 0.06 grams of bromine to the liter of the water examined. The bactericidal power of bromine has been tested by many workers, and it has always been found, except by Schüder, that 0.06 gram to the liter is sufficient to destroy all contained bacteria. Schumburg states that in spite of Schüder's investigations he must hold that 0.06 gram per liter free bromine will certainly kill the typhoid and cholera germs in water, and, further, that it is possible in a simple manner to remove the excess of bromine from the water, so as to form a tasteless drinking water, and, finally, that he has succeeded in bringing the method to a form available for practical purposes.

In regard to Schüder's test of the Hünemann method of water disinfection, Schumburg states in a supplementary paper that the most important of Schüder's demands are that the proper "enriching method" be employed before the plates are made, and also that in the investigation of the action of the method on the cholera vibrio "that a control test must be made to

show that the water used previously contains no indol-forming organism." This, according to Schumburg, is the weak point in Schüder's method. He states that if, as Schüder claims, it is necessary in the subsequent search for the cholera vibrio to investigate by means of the enriching method the entire amount of the water used in the investigation, so with equal force it might be said that it is necessary also to test the entire amount of the water before its infection and disinfection for indol-producing organisms by the use of the enriching method. If Schüder were to employ this procedure, there would of course be no water left to investigate; consequently his method is impracticable, if carried out to the letter. Schumburg also calls attention to the fact that Pfuhr has found indol-producing germs in water which he had sterilized, which were not cholera vibrios, but which were very probably resistant water or air germs. Schüder, he states, also saw upon his plates, which had been treated with "carefully sterilized" water, other colonies besides the cholera germs, and which he took for air germs.

Bonhoff, and his former assistant, Wynen, undertook the investigation of Schumburg's method of sterilizing drinking water after Pfuhr and Kaess had confirmed the favorable results of Schumburg. Especially large amounts of water were used in the investigation of its bacterial content after treatment. The results were very unfavorable, and the experiments were interrupted by the sickness of Wynen, who was taken with typhoid a short time after he had drawn some of the "disinfected" water through a pipette into his mouth. No other cause for the typhoid could be discovered, and it is especially remarkable that no typhoid bacilli could be detected in the water a portion of which Wynen drew into his mouth, although this water had been previously infected with typhoid bacilli before its treatment by Schumburg's method. The author took up the experiments afterwards, but in the meantime Schüder had reported his unfavorable results with the method. The author tested both ordinary and sterile water, which was afterwards infected with typhoid and cholera organisms, the cultures added to the water being in some cases filtered and in other cases not filtered. The results were unsatisfactory. It was possible to diminish the number of ordinary water germs, but it was not possible to make the water absolutely germ-free. He is, like Schüder, of the opinion that the more favorable results of Schumburg and Pfuhr may be accounted for by the fact that they used too small an amount of the disinfected water in searching for organisms which had survived the disinfection process.

OZONE.

The methods thus far considered have been designed and are useful, if at all, only for the purification of water in small quantities. The object of practically all of the investigators was to evolve a method which could

be used by individuals, especially by troops on the march, or for household use in times of epidemics, and for other similar purposes. They were not designed for the central purification of water, and, indeed, in this respect, not one of them would be at all useful. The expense would be too great, the procedure too laborious and impracticable, and, what is of still greater importance, the results obtained, even with small quantities of water, are not sufficiently definite to warrant the method being employed on a large scale. Even if the bromine or chlorine method were free from objection and absolutely certain in the sterilization of water in amounts not exceeding a few liters, it is easy to see why the same could not be applied to reservoirs holding millions of liters. Hence the methods already described have not been used for the purification of water in large amounts, nor have they even been suggested for this purpose by their originators.

There are, however, two methods designed for the chemical disinfection of water on a large scale, one of which at least has proved itself to be of value. These are (*a*) the method of purification by means of ozonized air, which has been undergoing practical tests in Belgium, Holland, France, and Germany for the past six years; and (*b*) the copper sulphate method, originally designed for preventing the growth of algae in aquariums, small ponds, lakes, etc., and later applied to the disinfection of drinking water by the United States Department of Agriculture.

Ozone, while only slightly soluble in water, is a very active germicide and oxidizing agent. The expense of producing it in large amounts, however, precluded its use in the purification of drinking water until about 1890, when the firm of Siemens & Halske, in Berlin, perfected apparatus by means of which its production was rendered much easier and less expensive. Frölich (*Gesundheits Ingenieur*, No. 16, Aug. 15, 1891, and *Elektrotechnische Zeitschrift*, 1891, L. 26), a civil engineer for Siemens & Halske, probably first considered the problem of the disinfection of drinking water by means of ozone in 1891. Tindal and his coworker, Schneller, in Belgium and Holland, also gave their attention to the practical application of the method, and in 1893 Schneller erected a large experimental plant at Oudshoorn, in Leyden, at which water from the "Alter Rhein" was treated. Van Ermengem (*Ann. de l'Inst. Pasteur*, 1895, IX, 673) tested this method and was able to report a satisfactory purification of water. Tindal exhibited at the hygienic exposition at Paris in 1895 an apparatus having a capacity of 2 cubic meters per hour. Ohlmüller and Prall (*Arb. a. d. Kais. Gesundh.*, 1902, XVIII, 417) state that a plant is in operation at Rotterdam, built after the system of Vosmaer, capable of furnishing 20 cubic meters of purified water per hour.

Abraham and Marmier have concerned themselves with the problem of the chemical disinfection of water

by means of ozone since 1895, and several other investigators have constructed various forms of apparatus for the same purpose, namely, Otto (*Memoires de la Soc. des ingenieurs civils de France*) and Gosselin (*ibid.*). Loir and Fernbach tested Otto's apparatus, reporting good results. The presentation of the various methods at the Brussels exposition in 1897 led to the erection of an experimental plant at Blankenberghe, in Ostend, with a capacity of 2,000 cubic meters daily. This, however, was soon abandoned, since it fell short of what was expected of it.

Of the various systems employed, those of Abraham and Marmier and of Siemens and Halske have been given the most thorough tests, and are without doubt the most useful, and inasmuch as all the methods are in general founded upon the same principle a description of these two will suffice for all, the others differing only in unimportant details.

As is well known, the so-called dark electrical discharge is capable of changing a portion of the oxygen of the air into ozone, the amount of ozone formed depending upon the tension of the discharge, being much greater with a high voltage than with a low one. The temperature of the conductors, however, increases with the tension of the current, and, inasmuch as a high temperature tends to destroy a portion of the ozone formed, this rise in temperature must be avoided; and this is accomplished by Abraham and Marmier, and also by Siemens and Halske, by cooling the conductors with running water. The output also increases with the nearness of the poles, but is lessened when sparking occurs. The various forms of apparatus which have been produced by different workers have been designed to surmount some or all of these objections.

The apparatus of Abraham and Marmier has been described and figured by Krull (*Jour. f. Gasbeleuchtung und Wasserversorgung*, 1901, XLIV, 102, and *Zeit. f. angew. Chemie*, 1901, 57). The ozonizing apparatus consists of an air-tight chamber, 2.6 meters high, in which the electrodes are hung parallel to each other. These electrodes are hollow cast-iron disks, the surfaces of which are covered with thick plates of glass extending beyond the edges of the electrodes, each electrode, except the first and last, having two glass plates. The arrangement of the electrodes in the chamber is such that between each + and - electrode there is a space through which air is forced. Cool water circulates in the interior of the hollow electrodes, and to prevent short circuiting and grounding the + electrodes are furnished with a water supply which is isolated from the supply furnished to the - electrodes, and both on entering and leaving the apparatus each stream is broken up into drops, so as to interrupt the conduction. The center of every glass plate and hollow disk, except the last, is perforated with a circular opening through which passes a large tube for the entrance of air. Through this tube air is forced and passes out through

small openings into the spaces between the electrodes, where, by means of the dark electrical discharge between the conductors, a portion of its oxygen is changed into ozone, and thus ozonized it leaves the chamber through a discharge tube.

In 1898 Abraham and Marmier received permission to establish an experimental plant at Lille, with a view to delivering a healthy water, free from objection. This city takes its water supply from a number of springs which arise in "made" ground or marshy soil. The water is rich in bacteria, especially in autumn, at which season of the year there are always many cases of typhoid fever at Lille. The results of experiments made at this plant have been reported by Roux and Calmette (*Ann. de l'Inst. Pasteur*, 1899, XIII, 344), who obtained a satisfactory sterilization. The report of a special committee appointed to examine into the practicability of the method is, in brief, summarized as follows:

1. The method of Abraham and Marmier has shown itself to be undoubtedly of value, and is in its action more powerful than any of the methods heretofore used for the sterilization of drinking water in large amounts.
2. The simplicity of the process and the permanence of the system, together with the constancy of the results, guarantee its invariable effectiveness.
3. All pathogenic microbes in the water are invariably destroyed, the hay bacillus alone resisting the process.
4. The water after treatment is not unwholesome, and its mineral content is unaltered.
5. The method is recommended to the city of Lille in order that a wholesome water supply may be obtained.

Abraham and Marmier do not use a greater concentration than 2 to 3 per cent, thereby avoiding giving to the water the taste or smell of ozone. At the same time the formation of oxides of nitrogen in the ozonizer and the addition of nitrogen to the water is avoided. The cooling of the electrodes also probably acts in the same way. According to the researches of Krull 5.8 mg. of ozone is sufficient for a liter of water, and this amount of ozone is contained in 1 cubic meter of the ozonized air. The cost of the process of ozonizing 1 cubic meter of air is about 1.74 pf. In order to figure from this the cost of sterilizing a given amount of water, one must know how much of the water and how much of the ozonized air pass through the purifier in one hour. In regard to this point little can be said, since it depends upon circumstances, some waters requiring a longer time than others for complete sterilization.

The firm of Siemens and Halske, to whom much credit is due for having made the use of ozone possible, have been at great pains since the establishment of the possibility of purifying drinking water by means of ozone to perfect a practicable method by the construction of suitable apparatus both for the production of ozone and for its application to water. As a result of

experiments carried out by this firm and of the recorded results of investigators using their apparatus, Siemens and Halske have erected in the northwestern part of Berlin an experimental plant having a capacity of 10 cubic meters per hour. This plant has been used by various investigators and has been the object of much interest and frequent consideration by various scientific boards.

Ohlmüller and Prall tested the method of Siemens and Halske on several different classes of water with good results. Compared with those obtained at Lille and Oudshoorn, the results obtained at the Berlin station are especially satisfactory. Typhoid and cholera bacteria added to the water to be treated were invariably destroyed; and, in order to test this point more fully, a smaller apparatus was also made use of, and the water examined by the Schüder "enriching method," already described, but with similar results.

The authors conclude as follows:

1. The treatment of water with ozone results in a considerable destruction of the contained bacteria. In this regard the ozone method surpasses central sand filtration in the removal of bacteria.
2. Cholera and typhoid bacteria suspended in the water are destroyed by this method.
3. The water is altered chemically only in a diminution of its oxidizable substances and in an increase in the amount of free oxygen, both rendering the water better.
4. The ozone subsequently held in solution in the water is without importance, since it is soon changed to oxygen.
5. The process renders the water more wholesome by destroying coloring substances.
6. The water receives no foreign taste or odor.

Weyl (*Journal für Gasbeleuchtung und Wasserversorgung*, 1899, XLII, 809, 826, and *Centralblatt f. Bakt.*, XXVI, 16) worked at the experimental plant of Siemens and Halske on the Spree. The tabulated results of this writer show that a water containing from 3,000 to 84,000 organisms per c. c. could be changed into one containing only a very small number of organisms—in general, between 15 and 100 per c. c. The organic matter contained in the water was also considerably reduced. The water on coming from the tower contains ozone, but in the course of a minute this is changed to oxygen. The water after treatment is tasteless and colorless. Even water of a dirty yellow color is rendered colorless by the process. The cost of sterilizing 1 cubic meter of water is stated by Weyl to be between 2 and 4 pfgr.

The author states that the ozone-purification process surpasses the method of sand filtration, the latter being by no means invariably certain in its action, as has been shown in many typhoid epidemics. The ozone plant also occupies a much less space than a sand filter, and consequently the first cost is less.

Erlwein (*Jour. f. Gasbeleucht. u. Wasserv.*, 1901, XLIV, 557, 574) describes the experimental plant of Siemens and Halske at Berlin, and reports favorable results from both a bacteriological and chemical standpoint. The investigations were made once a day and cover a period of over a month and a half. Bouillon and gelatin culture media were employed. Pathogenic germs were not added to the water at any time, but from the similar results obtained by Ermengem (*Ann. de l'Inst. Pasteur*, 1895, IX, 701) with Tindal's apparatus, Loir and Fernbach and Otto, he concludes that the pathogenic organisms are destroyed sooner than the saprophytic bacteria. In the second part of his paper (p. 574) Erlwein describes several modified forms of the Siemens and Halske apparatus, especially a better form of ozonizing apparatus, in which the electrodes are kept cool with running water, and also several forms of sterilizing towers. He also describes a portable sterilizing outfit, having a capacity of 1 cubic meter of sterilized water per hour; also a still smaller portable laboratory outfit for experimental work in the laboratory or for use by troops and expeditions. He also gives plans for a much larger sterilizing plant, designed to have a capacity of from 100 to 120 cubic meters per hour.

Schüder and Proskauer (*Zeit. f. Hyg.*, 1902, XLI, 227) have tested Siemens and Halske's method at their Berlin experimental plant. In testing for the number of living organisms present in the water after treatment they investigated large amounts of the water, instead of a few cubic centimeters, by means of Schüder's "enriching method." They added to the water to be tested in various experiments typhoid, cholera, colon, and dysentery bacilli. Their results were in general unfavorable when the sterilizing tower was filled with rather large stones, but they were very favorable when finer gravel was used. Typhoid bacilli added to the water were entirely destroyed with an ozone concentration of 3.4 grams to the cubic meter of air, 25 cubic meters of the ozonized air being passed through the tower at the rate of 25 cubic meters per hour, the water passing through at the rate of 1 cubic meter in 8 minutes. Cholera, colon, and dysentery bacilli were likewise destroyed. Their investigations show that the experimental plant is successful for the purpose of water purification against the above-named organisms when the ozone concentration employed is between 3.4 and 4 grams per 1 cubic meter of air; this ozonized air passing through the tower at the rate of 25 cubic meters per hour, while the water passes through at the rate of 1 cubic meter in 8½ to 9 minutes. This purification occurs with a reduction of the organic matter in the water, and requires about 2.24 mg. of ozone to the liter.

In a second paper (*Zeit. f. Hyg.*, 1903, XLII, 293) Proskauer and Schüder describe a large ozone sterilizing plant erected by Siemens and Halske at Wiesbaden. This large plant has a capacity of 250 cubic meters of water per hour, and is contained in a building 38×13×8

meters, which is separated into three compartments by partitions. These compartments consist of (a) the engine room, (b) the ozone apparatus room, and (c) the room for the sterilization towers. In the machine room are found two 60-horsepower engines, two direct and two alternating-current dynamos, two electric centrifugal pumps, and two air blowers to supply air to the ozonizing apparatus. In the room for ozone-forming apparatus are contained 24 ozonizers and 6 transformers. The sterilizing room contains 8 sterilizing towers, 4 meters high, and filled for about 2 meters with stones the size of a pigeon's egg. Through each tower flows 40 cubic meters of water per hour and during the same time 80 cubic meters of ozonized air.

The authors' results with the plant at Wiesbaden are similar to those reported with the smaller plant at Berlin. The amount of ozone used to a given quantity of water depends upon the amount of contained organic material, and the authors conclude that when properly employed the ozone method of water sterilization is effective.

From the results of various workers it will be seen that the ozone method of sterilizing drinking water has proven itself to be of much value and to be worthy of an extended trial on a large scale. Whether it surpasses in purifying power the method of slow sand filtration remains yet to be seen, and this can only be finally settled by the practical use of the method. It would seem, however, from what has already been accomplished, that with improved apparatus and methods the results bid fair to excel any procedure now in use for the central disinfection of drinking water, and experimenters along this line will await with much interest the publication of results obtained at the large plants now being erected and used in various parts of Europe.

COPPER SULPHATE.

For some years the United States Department of Agriculture has been carrying out experiments at the laboratory of plant physiology with the object of finding some substance which would be effective in destroying algae present in public water supplies and which at the same time would not be prejudicial to the health of the consumer. Moore and Kellerman, of the laboratory of plant physiology, in a report published by the Bureau of Plant Industry (a method of destroying or preventing the growth of algae and certain pathogenic bacteria in water supplies, Bulletin No. 64, Bureau of Plant Industry, United States Department of Agriculture, 1904), discuss the trouble caused by the presence of algae in public water supplies and consider the methods commonly employed for their destruction. From the results of experiments carried on in the laboratory of plant physiology, as well as from the results of other investigators, Moore and Kellerman decided that copper sulphate is the substance

adapted to the work in question. This salt has a very high toxicity for algae, and experiments with a number of forms usually found in reservoirs, and which are the source of much trouble, have shown that inconceivably small amounts of copper are poisonous in a high degree, but that the action is not equally pronounced upon all forms of algae, the toxic concentration varying greatly for different genera and also for different species of the same genus.

The method of procedure in studying this question was to determine, roughly, the death points of the forms under consideration, using Van Tieghem cells. Accurate solutions were then made with distilled water, and 200 c. c. of each solution was pipetted into an Erlenmeyer flask. The algae, if filamentous forms, were rinsed; if free swimming, they were concentrated by the Sedgwick-Rafter method (Whipple, the Microscopy of Drinking Water, New York, 1899, p. 15) from 500 c. c. to 5 c. c. volume, and this 5 c. c. was added to the treated water. The inaccuracy due to the addition of the 5 c. c. of untreated water to the 200 c. c. of treated water was disregarded. Whenever possible a test of these concentrations, determined experimentally, was made under natural conditions by treating the pool from which the species under consideration was taken. If this was impracticable, an additional series was carried through in aquaria of 15 liters capacity, in which were kept goldfish, frogs, minnows, crustacea, and rotifers. Since in no case was there an appreciable difference in the effect of a concentration upon a particular organism under either natural or artificial conditions, no special record is made of these gross experiments.

The results of these experiments are given in tables showing (1) the organisms with death points at higher concentrations than 1 part of copper sulphate to 1,000,000 parts of water, (2) those with death points between 1:1,000,000 and 1:5,000,000, and (3) those with death points at greater dilutions than 1:5,000,000. The authors state that even if enough copper is added to a reservoir to make a 1:1,000 solution nothing like this amount would appear in the water distributed. A very large percentage of the copper is combined with the algae and precipitated in other ways, so that practically none should remain in solution after the first few hours. Samples of water taken from a reservoir treated with sufficient copper sulphate to make a solution of 1:1,000,000 failed to show any reaction for copper after twenty-four hours, although all the algae were killed. They suggest the use of the method not only for disinfecting public reservoirs, but also in purifying the water of small pools and lakes, not only for the purpose of destroying the algae, but also to drive away reptiles and other pests, and possibly also to destroy mosquito larvæ.

The method of introducing the copper sulphate into a reservoir is given as follows: Place the required num-

ber of pounds of copper sulphate in a coarse sack—gunny sack or some equally loose mesh—and, attaching this to the stern of a row boat near the surface of the water, row slowly back and forth over the reservoir, on each trip keeping the boat within 10 to 20 feet of the previous path. In this manner about 100 pounds of copper sulphate can be distributed in one hour. By increasing the number of boats, and, in the case of very deep reservoirs, hanging 2 or 3 bags to each boat, the treatment of even a large reservoir may be accomplished in from 4 to 6 hours. It is necessary, of course, to reduce as much as possible the time required for applying the copper, so that for immense supplies, with a capacity of several billion gallons, it would be desirable to use a launch carrying long, projecting spars, to which could be attached bags each containing several hundred pounds of copper sulphate.

The value of copper sulphate as an agent for the destruction of algæ in public reservoirs suggested its use in the destruction of bacteria in water supplies. The authors undertook a series of experiments with different organisms, the results of which are given in tables and may be summarized as follows: The tables show that *bacillus typhi* is more sensitive to copper sulphate than is *bacillus coli*, that the para group are about equally sensitive, and that temperature has a very important bearing on the toxicity of the copper in solution. At room temperature, which is near the temperature of a reservoir in summer, a dilution of 1 to 100,000 is fatal to the typhoid bacillus in 3 to 5 hours; at 5° it requires 24 hours for complete destruction. The results obtained were checked in three ways:

(1) Five cubic centimeters of each of the solutions to be tested, made up with filtered hydrant water and check tubes of the same water, were sterilized in test tubes. To each of these was transferred one 3-millimeter loop of a bouillon culture of the bacillus. After the proper exposure a 3-millimeter loop of the inoculated water from each tube was transferred to a sterile bouillon tube with a corresponding number. These bouillon tubes were then incubated 46 hours at 38°, the time and concentration of the agent required to prevent growth being noted.

(2) Instead of transferring to bouillon tubes from the inoculated water, the transfer was made to gelatin tubes, and plates were poured in 10 centimeter Petri dishes, thus making it possible to estimate the reduction in the number of bacteria in concentrations not sufficient to prevent growth.

(3) Five 12-liter aquaria, 2 of which contained a high percentage of organic matter, also a large quantity of algæ, and other aquatic plants were inoculated, each with 3 cubic centimeters of cultures of *bacillus typhi* of different ages, and allowed to stand 18 hours, and 2 poured plates were made from each aquarium, the 3-millimeter loop being used in all cases. To

these aquaria were then added a 1 per cent solution of copper sulphate in sufficient quantity to produce the desired concentration. After the proper time had elapsed another series of plates was made, this being repeated every 2 hours for a period of 12 hours.

The tests were made upon 4 distinct cultures of *bacillus typhi*, designated respectively Wasserman, Stokes, Say, and Longcope, and, except in the case of the aquaria series, upon *bacillus coli* and some of the para forms. These organisms were obtained from the laboratory of H. K. Mulford & Co. The method of procedure in determining the toxic concentration for *microspira comma* (*spirillum cholerae*) was identical to that employed in the case of *bacillus typhi*.

The authors summarize the report as follows:

The importance of maintaining all public water supplies at the highest degree of purity and wholesomeness is too well recognized to require any discussion.

The disagreeable odors and tastes so often present in drinking water are due almost exclusively to algæ, although the economic importance of studying these plants has not been recognized until recent years.

These algal forms are widely distributed, and reservoirs in many States have been rendered unfit for use by their presence.

The methods now known for preventing or removing the odors and tastes caused by algæ have proved unsatisfactory, either because of prohibitive expense or failure to accomplish the result.

It is therefore desirable that some new, cheap, harmless, and effective method be devised for ridding reservoirs of these pests.

It has been found that copper sulphate in a dilution so great as to be colorless, tasteless, and harmless to man is sufficiently toxic to the algæ to destroy or prevent their appearance.

The mode of application makes this method applicable to reservoirs of all kinds, pleasure ponds and lakes, fish ponds, oyster beds, water-cress beds, etc. It is also probable that the method can be used for the destruction of mosquito larvæ.

At ordinary temperatures 1 part of copper sulphate to 100,000 parts of water destroys typhoid and cholera germs in from 3 to 4 hours. The ease with which the sulphate can then be eliminated from the water seems to offer a practical method of sterilizing large bodies of water when this becomes necessary.

The use of copper sulphate for the prevention of disease is regarded as incidental, and is not designed in any way to supplant efficient measures of prevention now in use. It is believed, however, that up to this time no such satisfactory means of thoroughly, rapidly, and cheaply sterilizing a reservoir has been known. Since the selective toxicity of copper sulphate renders it fatal to pathogenic forms peculiar to water, while the saprophytic or beneficial bacteria are unaffected, the method is particularly well adapted for this purpose.

Definite knowledge in regard to what organisms are present, the constitution of the water, its temperature, and other important facts are necessary before it is possible to determine the proper amount of copper sulphate to be added. A microscopical examination thus becomes as important as a bacterial or chemical analysis.

No rule for determining the amount of copper sulphate to be added can be given. Each body of water must be treated in the light of its special conditions.

The cost of material for exterminating algæ will not exceed 50 to 60 cents per 1,000,000 gallons, and will usually be less. The destruction of pathogenic bacteria requires an expenditure of from \$5 to \$8 per 1,000,000 gallons, not including the cost of labor.

Although the above-described method may be ef-

fective in removing algæ from reservoirs, it is difficult to believe that such small amounts of copper sulphate can be relied upon for the destruction of the typhoid bacillus. The experiments of the authors are, in fact, open to the same objections which Schüder brought against the methods of Schumburg, and Hünemann, and Deiter; that is, that too small amounts of the disinfected water were used in searching for living organisms; and also because the authors worked so largely with solid media. It seems to be quite likely that less favorable results would be obtained if Schüder's "enriching method" were employed; and until further and more complete investigations of the method are made, its value can not be accurately estimated.

APPENDIX III.

A PAPER ON TYPHOID BACILLURIA PREPARED UNDER THE DIRECTION OF THE BOARD.

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Of the many ways in which the typhoid bacillus can be disseminated by human beings, probably none possesses a greater etiological significance than does the infected urine. Because of the frequency with which it is voided, the myriads of organisms that it may contain, its relatively inoffensive character and the consequent indifference to the place of its disposition by ignorant and careless nurses and convalescents, it becomes one of the most potent factors in the spread of the disease. That little attention has been given to this subject may be inferred from the relative infrequency with which it has been treated in the literature, for, considering the widespread prevalence of the malady, comparatively few thorough and complete studies have been made, but more important than this, however, is the indifferent and negligent attitude of both hospital and private practice toward this important subject.

It is difficult, in the light of present knowledge, to say how often the urine becomes infected with the specific organism in typhoid fever, nor are we likely to know with any degree of certainty until more reliable means for the recovery, isolation, and identification of the germ are employed than has been used in the majority of the recorded studies, and, furthermore, until it is more clearly established how and under what conditions the organism gains access to the urinary bladder. In much of the work hitherto reported no mention is made of the methods of differentiation, and, as is commonly known, until recently the means employed in distinguishing the typhoid bacillus from kindred groups were inadequate and uncertain.

Among the first to note the existence of the condition was Bouchard (*Rev. de Med.*, 1, 1881, p. 671). In the year 1880 his attention was attracted to the subject by finding large numbers of bacilli associated with albuminuria in cases of typhoid fever. A series of cases which he studied he reported as follows: In a total of 65 cases, 44 were free from albuminuria, while in 21, a little more than 32 per cent, both albumin and bacilli were found. The bacteria disappeared with the albuminuria and all of the organisms were of the same

morphological character. Nine of these 21 cases terminated fatally. Post-mortem examinations revealed a transitory nephritis with bacteria in the renal tissue. No mention is made of the morphological characteristics observed; moreover, morphological evidence is not held to be sufficient for the identification of the typhoid bacillus, so that there is no assurance that they were the specific organisms of the disease.

Schueder (*Deut. Med. Woch.*, No. 44, s. 762) in 1901 reviewed the subject. He gathered from the literature, from 1881 to 1900, a series of 599 cases, 177 of which, or 29.5 per cent, were found to present bacilluria.

Many of the studies in this series are of doubtful reliability because of faulty technique or insufficient differential methods employed. The same criticism is applicable to any statistical study based on the observations of the early workers, so that herein is considered only the results obtained by some of the more recent and authoritative observers. These are embodied in the following table:

Table showing the frequency of typhoid bacilluria as obtained by recent investigators.

Number.	Author.	Year.	Total number of cases investigated	Number of cases showing bacilluria.	Per cent of cases showing bacilluria.	Literature.
1	Petruschky.....	1898	50	3	6	Centr. f. Bakt., Bd. XXIII, 14.
2	Schichhold.....	1899	7	5	71	Deut. Archiv. f. Klin. Med., Bd. 64, s. 505.
3	Horton-Smith....	1900	39	11	28	Lancet, Vol. 1, p. 915.
4	Neufeld.....	1900	12	3	25	Deut. Med. Woch., Bd. 51, s. 824.
5	Lewis.....	1901	45	1	2	Edin. Med. Jour., Vol. X, pp. 261 and 567.
6	Klimenko.....	1901	65	13	20	Russky Archiv. Path., XII, 2.
7	Cole.....	1901	49	17	35	Johns Hopkins Hosp. Bull., Vol. XII, 203.
8	Schueder.....	1901	22	5	23	Deut. Med. Woch., Bd. 44, s. 762.
9	Bliss.....	1902	311	31	10	Edin. Med. Jour., Vol. XII, p. 337.
10	Fuchs.....	1902	41	4	10	Wien Klin. Woch., Bd. 15, s. 170.
11	Jacobi.....	1902	27	5	19	Deut. Archiv. f. Klin. Med., Bd. 72, s. 442.
12	Richardson.....	1903	103	22	21	Boston M. & S. J., Vol. 148, p. 152.
13	Herbert.....	1904	98	19	18	Munch. Med. Woch., Bd. LI, s. 11.
	Total.....		869	139	16	

It will be noted that a wide degree of variation exists, Petruschky finding it in but 6 per cent of his 50 cases; Horton-Smith in 28 per cent of his 39 cases; Schichhold in 5 of his 7 cases, or 71 per cent; Schueder in 5 of his 22 cases, or 23 per cent. Richardson (see table) reviewed literature from 1887 to 1903, and states that 30 observers have made bacteriological investigations of the urine in 1,291 cases of typhoid fever, detecting bacilluria in 278 instances, which is 21.5 per cent. In his own series of 103 cases, 22, or 21 per cent, were positive.

The interpretation of these discordant results may partly find its explanation in the differences in technique employed. Where reliance is placed on a microscopical examination of the fresh drop for the detection of the condition, error is likely to follow. This is illustrated by the work of Fuchs (see table), who discovered bacilluria present in 4 of his 41 cases. In 2 of these the germs were so few in number as to escape notice under the microscope and were detected by cultural methods.

As a rule, however, they are usually present in large numbers, so as to cause a distinct cloudiness of the urine. Petruschky's case showed 170,000,000 per cubic centimeter, and Gwyn's (Phil. Med. Jour., 1901, VII, p. 81) 500,000,000 per cubic centimeter. The turbidity of the urine is not an infallible sign, however, and is not to be depended upon. The organisms are usually found in pure culture, but not always. The likelihood of mistaking other organisms for the typhoid bacillus is a factor of some moment, as will be appreciated by anyone who has attempted to differentiate the typhoid from some of the closely allied types.

In 6 of Fuchs's 41 cases there was an elimination of various bacteria which were not the specific organism. In Blumer's (Johns Hopk. Hosp. Rept., Vol. V, p. 327) the colon bacillus was present in 7 cases—once in association with typhoid and 6 times in pure culture. The staphylococcus albus was found once in pure culture; and the typhoid bacillus twice—once with the colon and once alone. In 1 case an unidentified coccus was recovered. In 2 of Schichhold's cases the colon was present in association with the typhoid bacillus and in 1 instance the colon was present in pure culture. In 1 of Jacobi's cases there was a mixed infection of cocci and typhoid.

The organisms may be present in the bladder for but brief periods of time, so that unless repeated examinations are made the condition may entirely escape notice. For instance, in 4 of Schueder's cases they were found on one day only. It is quite probable that this occurs frequently. The persistence and growth of the germs in the bladder depend upon two factors, suitability of the urine as medium and infrequent urination. The urines of some patients form a very good culture media, other specimens may be less so. In typhoid fever infrequent and scanty urination is the rule. Hence the long periods of retention offer favorable opportunity for the incubation and development of the

germs. Generally the bladder is incompletely emptied at micturition and retained urine remains to infect the further secretion of the kidneys.

Bacilluria may appear very early in the course of the fever, or not until late in convalescence; generally it is detected during the second or third week. Horton-Smith discovered it in 1 case on the eighth day of the disease. Kilmenko's 13 cases all appeared before the third week. In 12 of Herbert's cases the bacilli were found 1 to 2 weeks after the onset of the fever; in 4 cases about the end of the third week. In one of Schueder's cases the condition did not appear until the forty-ninth day after the onset of the disease.

The duration of the bacilluria depends on the factors before mentioned, viz, the suitability of urine as medium for growth and frequency of urination; also upon reinfection from blood or elsewhere, and finally upon treatment. Unrelieved, the condition may continue for weeks, even years. Büsing writes of a soldier (Deut. Med. Woch., June 19, 1902, p. 443) in whose urine the germs persisted for over six months. Houston (Brit. Med. Jour., June 14, 1899) has recorded a case which lasted for three years, and Young (Johns Hopk. Hosp. Rept., Vol. 8, p. 401) another which continued for seven years. As a rule, however, the condition yields to treatment or disappears itself in a few days to as many weeks.

It has been suggested that the occurrence of bacilluria in a measure depends on the severity of the disease. It is difficult to say how far this is true. On the whole, it would seem that the condition bears a relation to the degree of illness. In Horton-Smith's 11 positive cases 1 was mild, 5 were moderately severe, and 5 were severe, while in a series of 28 cases in which the examination of the urine was negative, 13 were mild and 4 were moderately severe. In Jacobi's series 3 were moderately severe and 1 was severe. One of Schichhold's cases was mild, 4 were severe. Lewis examined 45 cases in Edinburgh City Hospital involving a large number of specimens, and discovered the condition present only once, about 2 per cent. He attributes the low per cent to the mildness of the disease, and says that typhoid bacilluria is more often associated with the severer forms of the disorder. The epidemic studied by Herbert was of mild form. Four of his cases were severe, 11 moderately severe, and 3 mild. That the disease may be severe without the occurrence of the condition is shown in Horton-Smith's 28 negative cases, of which 9 were severe. Kilmenko found no relation between the appearance of the bacilli and the severity of the disease. In Richardson's series (Jour. Exper. Med., 1899, p. 24) 1 case was mild, 6 were moderately severe, and 6 were severe.

In the face of the foregoing evidence it is extremely problematical how frequently bacilluria does occur. The observations of Richardson and Horton-Smith, the two workers who have probably given the subject the

most thought, suggest that the true figure lies somewhere between 20 and 30 per cent. It is very possible its occurrence varies with the severity of the malady, and that there are epidemics where the frequency of the condition is much less than suggested by these figures. The more persistently and diligently examinations are made the more frequently is the bacillus discovered. It would seem that the presence of the organisms in the blood bears a relation to their appearance in the urine. If, as is believed, the bacilli are always present in the blood in some stage of the disease, it is not improbable that they find their way into the urine more often than bacteriological evidence warrants. It must be admitted, too, that the means now employed for the recovery of the organism are not wholly convincing. If in a case where relatively few germs find their way into the urine and are isolated, their identity can be very satisfactorily established and the urine declared to be infected with the specific organism; but if, on the other hand, the attempt is not successful, even after the most careful search, it can not be therefore concluded that the urine is germ free. In other words, while bacteriological technique has been sufficiently perfected to enable one to render a positive opinion in a given case, it has not as yet reached that stage where a negative opinion obtains with equal surety. Hence, it is not improbable that the urine becomes infected in this disease much more frequently than is now supposed.

The association of bacilluria with albuminuria has been noted so many times by different observers that it is maintained by some that the former never occurs without the latter. Cases are cited in the literature, however, where the bacteria have been present in the absence of albumen, and it is possible their synchronous appearance in the urine is a coincidence as often as it is a matter of dependence. In any event albuminuria is present with much greater frequency than is bacilluria. McCrae (*American Medicine*, Vol. VI, p. 503) in a review of 575 cases noted albuminuria 264 times, or 46 per cent. Casts were observed in 162 cases, or 28.2 per cent. Osler (*Johns Hopk. Hosp. Rept.*, vol. 8, p. 423) states that in his 829 cases albumen was present in 616 instances, or 74 per cent. Casts were noted in 391 cases, or 47 per cent. He says that although albuminuria is so common in typhoid fever, accompanied also by tube casts, it rarely is a serious condition, and indicates only the mildest possible grade of disturbance in the function of the kidney. In a more aggravated condition, where the albumen is in larger amount, hyalin and granular casts and red blood corpuscles are abundant, we have to consider it an acute nephritis.

Pyuria, associated with the typhoid bacillus, occurs occasionally. Blumer studied the subject and noted it in 2 of his 60 cases. He states that while present fairly frequently in typhoid fever, pyuria is a complication of no gravity, and is only important from a prophylactic standpoint. Young, in reporting the case before

referred to, says that a severe infection with the typhoid bacillus, along with an abundant presence of pus, is not generally accompanied by symptoms of vesical irritation, and in the few cases that are this condition seldom persists for more than a few days, although the bacilli are still present. Gwyn (*Johns Hopk. Hosp. Bull.*, vol. 8, p. 109) reports 5 cases of cystitis due to the typhoid bacillus. Perhaps the most important features of this complication are the mildness of the concomitant symptoms and the infectivity of the pus.

As Petruschky, Richardson, and Gwyn have shown, when the organisms are present in the bladder they are usually there in enormous numbers, so that a single drop may contain millions. In the act of micturition the patient is very likely to soil both his person and his linen, and since this is not particularly objectionable to either sight or smell, but little heed is paid thereto; whereas, scrupulous care is employed in removing the more offensive but less infective and dangerous fecal matter which may be similarly deposited. When such a patient is bathed it is obvious that enormous numbers of bacilli are washed off into the water, which in numerous ways may become an infecting medium. So, too, with soiled linen. There is an instance recorded in which a small epidemic was started through contaminated linen in a laundry. Both in hospital and private practice it has long been the custom to regard the typhoid stools as suspicious and dangerous material, and much zeal and thought have been directed to the subject of their disinfection, but thus far very little attention has been given to the urine, which, as has been shown, may remain infective for months or even years after convalescence—long after the organisms have disappeared from the bowels. Such a case is a walking breeder and disseminator of the disease. With his infected urine, wherever he chances to micturate he is constantly polluting the sewage, or the ground soil, which later may be wafted hither and thither by dust and flies.

Albutt (*Brit. Med. Jour.*, July 15, 1901) reports an instance where a woman who had recently recovered from typhoid fever returned to work on a farm. Shortly after she was employed at another place, where her presence was followed by another outbreak. The woman presented no bowel symptoms, and was apparently well. Albutt satisfied himself by investigation that infected urine was responsible for these outbreaks. Walker (*Brit. Med. Jour.*, 1900, Vol. II, 1494) reports a similar instance where a returned soldier infected the well-water supply of a family, giving rise to 12 cases of fever. Petruschky relates a case of a nurse who drank out of a glass which a patient suffering from bacilluria had used in a moment of urgency as a urinal. After an incubation period of 12 days she became ill with typhoid fever.

From the foregoing evidence the treatment of the condition naturally resolves itself into two measures,

the disinfection of the voided urine, containing vessels, soiled linen, etc., and the elimination of the bladder infection. Various means for the sterilization of urine have been suggested, some of which are impracticable and most of them inefficient. Gwyn (*Phil. Med. Jour.*, vol. 7, 1901, p. 81) has made an extended study of this subject. From his experimental work he summarizes as follows:

The principal disinfectants now in use in hospitals are milk of lime, carbonic acid, bichloride of mercury, formaldehyde, chlorinated lime, and liquid chlorides.

Milk of lime is the cheapest disinfectant; it is, however, neither rapid nor certain, and, to obtain results at all satisfactory, one must use a solution so concentrated that, on standing, it will precipitate half its actual volume of lime. With such a solution 10 c. c. of infected urine were disinfected by 4 to 5 c. c. of milk of lime in $2\frac{1}{2}$ hours.

Carbolic acid was found to be of value only in large amount or very strong solution if speedy results are wished.

In contrast to these two substances is the action of bichloride of mercury, which in the urine is both a powerful and rapid disinfecting agent. It is clean, odorless, and an easily applied disinfecting agent when in solution.

Formaldehyde was found a fairly efficient disinfecting agent; its expense, however, precludes its use except in very dilute solution.

Chlorinated lime, applied by making a saturated solution and using the supernatant fluid, is one of the most reliable disinfecting agents. Free chlorine is evolved when mixed with urine, particularly if the urine is acid. The liquid chlorides, a mixture of chlorides of zinc, aluminum, and copper are much used and are very efficient.

It is generally supposed and has been stated that in highly albuminous urines some disinfectants become less effective, and that, in case of bichloride of mercury, the formation of an albuminate destroys its disinfecting power. Experiments did not bear this out. In a urine containing 0.3 per cent albumin, disinfection with various substances was just as complete and rapid as in other urines.

He concludes as follows:

"Milk of lime hardly deserves the name of disinfectant. Carbolic acid is of use only in large amounts and in strong solution, if a speedy result is wished. Formalin is hardly serviceable on account of its cost, but is nevertheless an efficient disinfectant. Bichloride of mercury, chlorinated lime, and liquid chlorides are of real value, and are efficient in comparatively dilute solutions.

For disinfection immediately and within 5 minutes a volume of urine would require—

- 1/2 of its volume of 1:20 carbolic acid solution, or
- 2/3 of its volume of 1:40 carbolic acid solution, or
- 1/5 of its volume of 1:1,000 bichloride solution, or
- 3/10 of its volume of 10 per cent formalin, or
- 1/40 of its volume of chlorinated lime solution, or
- 2/5 of its volume of liquid chlorides.

For disinfection within 1/2 to 1 hour a volume of urine would require—

- 3/10 to 4/10 of its volume of 1:20 carbolic acid solution, or
- 2/5 of its volume of 1:40 carbolic acid solution, or
- An equal volume of 1:100 carbolic acid solution, or
- 1/40 of its volume of 1:1,000 bichloride solution, or
- 1/20 of its volume of 1:2,000 bichloride solution, or
- 1/10 of its volume of 10 per cent formalin, or
- 3/10 of its volume of 5 per cent formalin, or
- 1/2 of its volume of 1 per cent formalin, or
- 1/10 of its volume of liquid chlorides.

For disinfection within 2 to 4 hours a volume of urine would require—1/2 of its volume of 1:20 carbolic acid solution, or 2/10 to

3/10 its volume of 1:40 carbolic acid solution, or an equal volume of 1:4,000 or 1:5,000 bichloride solution, or an equal volume of milk of lime solution equal to half its volume of the solution."

The bladder condition has likewise been the subject of considerable study. The various so-called genito-urinary disinfectants have been tried, and with one exception have proven unreliable and inefficient. Vesical irrigation has been resorted to, but this is difficult, impracticable, and not without danger. Urotropin, the bladder antiseptic before referred to, is an ammonia compound of formaldehyde, which is excreted by the kidneys. In the bladder it partly decomposes into formaldehyde. This is the most useful agent that has yet been employed. The literature furnishes several studies of its action in bacilluria, with almost unvarying positive results. The testimony of most observers is that its use is followed by a complete and permanent disappearance of the bacilli from the urine. Very infrequently does it produce untoward symptoms, which are at once relieved by discontinuing the remedy or decreasing the dose. Mild gastric disturbance and hæmaturia are the chief complications met with. Richardson says that urotropin, in the vast majority of cases, will remove the organisms even in cystitis (*Jour. Exper. Med.*, 1899, 24). He treated 11 cases, as follows: Two cases with salol alone; in one instance the bacilli disappeared; 1 case received first salol with negative results. Urotropin was then substituted for the salol and the bacilli disappeared almost immediately. Nine cases, including the first treated with salol, were treated with urotropin and in every instance the use of the drug was followed by disappearance of the bacilli. Moreover, this was accomplished in 8 out of 9 cases by 60 grains or less of the remedy. One case required 200 grains. The cases were examined repeatedly after the administration of the urotropin was stopped and no bacilli reappeared. He prescribes it in 10-grain doses three times a day in all cases, whether bacilluria is present or not, throughout the course of the disease and for some time into convalescence. Bliss, Schüder, Büsing, Lewis, and others have obtained similar results. However, there is not complete unanimity as to its efficacy. Sehumburg (*Deut. Med. Woch.*, Feb. 28, 1901, No. 9, p. 134) investigated the urine after the administration of urotropin to see whether the action of the drug was a destructive or an inhibitory one. He placed threads infected with the typhoid bacillus in nutrient media to which urotropin urine from a healthy person had been added. No growth took place, although the threads were observed for several days, but when one of the threads was removed and placed in plain bouillon, a prompt and vigorous growth occurred. He therefore believes the action an inhibitory one. Fuchs (*Wien. Klin. Woch.*, 1902, p. 170) is of the same opinion.

The presence of the typhoid organisms in the urinary bladder has been explained in a variety of ways, chief of which are that it is either a filtering process or an

excretory one on the part of the kidney. We have no experimental evidence or other reason to believe that the kidney can functionate as a filter; moreover, there is justification for the belief that it does not do so. As has been pointed out elsewhere, the typhoid organisms undoubtedly invade the blood stream in every case of the disease. Definite information is wanting as to how long this bacteremia may persist; but since the condition has been detected both early and late in the disease, it is reasonable to suppose that the bacilli are present in the blood for a considerable period of time during the course of the fever. If this be so, and the kidney merely acted mechanically as a filter, it would be expected that the bacilli would be constantly present in the urine. Of course, this is not the case. The ability to excrete the living organism is also attributed by some to the kidney, but it is to be doubted if it ever possesses any such action. Another explanation, and one quite widely held, is that the bacteria themselves or their products by their local action create a condition of lowered resistance through which, in some way unknown, they pass to the tubules and thus into the urine and bladder.

The focal localization of the infection in the kidney or the occurrence of an acute nephritis complicates but few cases.

Neumann (*Berl. Klin. Woch.*, 1890, Bd. XXVII, 121) maintains that bacteria are excreted from the kidney only in case of lesions therein, and that the lesions are similar to the small focal necrotic areas seen in the spleen and liver which have been termed lymphomatous nodules. He also says that the toxins in the blood cause lesions in the kidney which lets the bacilli through, and that the bacilli play an unimportant part. Flexner (*Johns Hopkins Hosp. Rept.*, 1895, Vol. V, 343) has reported two cases of typhoid septicemia associated with focal abscesses in the kidneys, due to the typhoid bacillus. The glomeruli in the infiltrated area were the parts chiefly involved. The bacilli gained entrance to the tubules through the glomerular capillaries. Undoubtedly some cases of bacilluria are explainable in this way. The focal localization of the infection in the kidney, or the occurrence of an acute nephritis, complicates so few cases of typhoid fever that they are inadequate to explain the frequency of bacilluria, and the fact that these conditions may exist without infection of the urine suggests that there are other factors involved.

Horton-Smith (*Lancet*, Vol. I, 1900, p. 915) offers a

very plausible explanation. He believes that a stray organism finds its way from the blood into the bladder, very probably through the kidney. Here it grows and multiplies rapidly. He thus explains the sudden onset of the condition, the enormous number of organisms present, and the occurrence of bacilluria without albuminuria. If the urine is favorable for growth, and urination is incomplete and infrequent, conditions very propitious for the development and continuance of a luxuriant culture are afforded. He offers as proof that the origin of the condition lies in the bladder, the fact that it may be cured by local treatment. As further proof, he cites a case which came to autopsy. The urine of the patient shortly before death was found to contain both albumen and typhoid bacilli. Typhoid bacilli were demonstrated in the spleen, liver, gall bladder, and urinary bladder, but not in the blood nor in the kidneys. He thinks a stray bacillus entered the urinary bladder and gave rise to the condition.

CONCLUSIONS.

1. Typhoid organisms are found in the urine of about one-fourth of all cases of typhoid fever. They may appear at any stage of the disease, even late into convalescence, but, as a rule, are first seen at the end of the second week or at the beginning of the third. They may remain in the urine for but a few hours, or may persist for years.
2. The bacilluria is frequently associated with albuminuria.
3. The specific bacillus is usually found in pure culture, but may be found in association with other organisms, notably the colon bacillus.
4. Clothing stained with infected urine, or soil, or sewage polluted thereby may be the source of future infections.
5. Because of the frequency with which it is voided, its comparative inoffensiveness, its easy dissemination, and the relatively great number of organisms present, infected urine is the most dangerous excretion of the typhoid patient.
6. The urine of all typhoid cases should be regarded with suspicion, even in convalescence, and measures instituted to prevent, if possible, the inception of the bacilluria, or limit its dangers should it occur. In any case the urine should be thoroughly disinfected, and nurses and attendants instructed concerning the possibilities of it as a source of further infections.

